BMJ Open

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Journal:	*BMJ Open*
Manuscript ID	bmjopen-2019-029397
Article Type:	Research
Date Submitted by the Author:	24-Jan-2019
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Keywords:	Nursing, EDUCATION & TRAINING (see Medical Education & Training), MEDICAL EDUCATION & TRAINING, Clinical learning

How do undergraduate nursing students learn in the hospital setting? A scoping review of conceptualisations, operationalisations and learning activities.

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Word count

4030

Key words

Undergraduate nursing education, learning in practice

ABSTRACT

Objectives. This study aimed to provide insight in conceptualisations of 'learning in practice' in the nursing education literature, as well as in their operationalisations and outcomes in terms of learning activities. The eventual aim was to propose terminology to guide future studies.

Design The scoping framework proposed by Arksey and O'Malley was used. In a first systematic search, concepts equivalent to 'learning in practice' were identified. In a second search, studies operationalising these concepts were searched in PubMed, EBSCO/ERIC and EBSCO/CINAHL. Eligible articles were studies that examined the regular learning of undergraduate nursing students in the hospital setting. Conceptualisations, theoretical frameworks and operationalisations were mapped descriptively. Results relating to how students learn in clinical practice were synthesized using thematic analysis. Quality assessment of the studies was performed using the CASP checklist.

Results From 9360 abstracts, 17 articles were included. Five studies adopted as their object of study a general, yet not explained, synonym for learning in practice, the other studies approached the topic focusing on the social, unplanned, or active nature of learning. All studies used a qualitative approach. The small number of studies and medium study quality hampered a thorough comparison of concepts. The synthesis of study results revealed five types of learning activities, in which increasing autonomy, interactions, and cognitive processing were central themes. These themes were acknowledged by an expert panel.

Conclusions The current body of literature offers little guidance on which concepts to use to study clinical learning in undergraduate nursing education. The reviewed studies show agreement about the key elements of clinical learning. In future research, formal and informal components of learning should be addressed, and clarity about desirable outcomes of clinical learning should be provided. Also, the interplay between behaviour and cognitive processing in clinical learning should be further investigated.

ARTICLE SUMMARY

Strengths and limitations of this study

- This study followed a rigorous design, using an established research framework, a comprehensive two-step search strategy and a well-documented selection process.
- The analysis of both conceptualisations, study quality and study results allowed for the identification of quantitative and qualitative gaps in the literature.
- A limitation is that the literature search only covered undergraduate nursing education in the hospital setting, while a comparison with literature on learning in practice in other health professions would enrichen our understanding of potential conceptualizations.

INTRODUCTION

Learning in the clinical setting is crucial for becoming a competent nurse[1]. However, although a vast body of knowledge exists on factors that influence learning, the process itself remains underexposed in the literature[2]. Understanding learning in the clinical setting can help design, supervise and evaluate individual learning trajectories. In the nursing education literature, just as in other health professions education literature, different terms are used to describe and study learning in clinical practice, with different underlying theoretical or conceptual frameworks.

This study aimed to examine how different concepts that are equivalent to 'learning in practice' are operationalised in the literature about undergraduate nursing students' learning in clinical placements. Another aim was to propose terminology to guide future studies. Finally, we aimed to synthesize study results that directly relate to how nursing students learn in clinical practice. To our knowledge, the only study that included distinct concepts of clinical learning in the health setting in a review before, was a concept analysis of work-based learning in health care education from 2009[3]. The authors identified common attributes, enabling factors and consequences of workplace learning and proposed a definition. The current review built on this work by critically examining the use of these concepts within the context of undergraduate nursing education and analysing their outcomes.

To enable comparison between studies, we focused on undergraduate students in the general hospital setting. This context is the traditional setting for nursing training and comprises a variety of factors that may be relevant for learning, such as the presence of peers and different healthcare professionals, as well as complex and acute patients, thereby offering a wide array of multidimensional learning opportunities[4]. Moreover, we limited our study to undergraduate (also called bachelor, diploma or associate degree) education, which is the initial training that prepares for registration as a nurse, in which students learn the profession and shape their identity. As a final demarcation allowing for the comparison between concepts, we focused on studies about how students learn during their regular day to day work at the ward, instead of evaluations of specific interventions or models.

METHODS AND ANALYSIS

The scoping review approach was chosen, as it can help understand complex concepts through clarifying definitions and conceptual boundaries[5] and enables to identify key concepts and gaps in the literature[6]. The approach developed by Arksey and O'Malley [7] and refined by Levac, et al. [8] and the Joanna Briggs institute [9] was used, consisting of the six stages (1) identifying the research question; (2) identifying relevant studies; (3) selecting studies; (4) charting the data; (5) collating, summarizing and reporting the results; (6) expert consultation. Reporting on this scoping review

followed the PRISMA Extension for Scoping Review checklist[10], as outlined in supplementary file 1. The review followed an a priori developed research protocol, with Manuscript id bmjopen-2018-024360 (see supplementary file 2) with a little deviation by choosing the CASP checklist over the quality indicators of Buckley et al. [11] for quality assessment, as this allowed for more specific and systematic quality assessment. As anticipated, study questions and refined inclusion criteria were added during the search process.

Stage 1. Identifying the research question

The original research question was:

- How are different concepts that are used as an equivalent to learning in the hospital setting operationalised in the undergraduate nursing education literature?

To which the following question was added to guide our analysis of results:

- Which activities do undergraduate nursing students learn from in the clinical setting?'

Stage 2. Identify relevant studies

As suggested by the Joanna Briggs institute[9], a comprehensive search strategy was iteratively developed (by MS and JCFK) following the Peer Review of Electronic Search Strategies (PRESS) 2015 guideline statement[12], starting with a broad search (search step 1) to inform the subsequent search strategy (search step 2). The different search queries were first developed for PubMed and later extended to EBSCO/ERIC and EBSCO/CINAHL. See our search strategy for both steps in supplementary file 3.

In search step 1, from inception to May 2018 the terms 'learning in clinical practice' and 'undergraduate nursing students' were combined to identify concepts that are used as an equivalent to 'learning in clinical practice' and could be included in the second search step. Eligible concepts were those relating to the process of clinical learning rather than specific aspects of it or associated factors. The first 200 abstracts were scanned by the two reviewers (MS and RAK) on potentially eligible concepts. As the researchers reached full agreement, the first reviewer screened the rest of the abstracts. After all abstracts had been screened, all concepts were discussed between the two reviewers and a final selection of concepts to be included in the second search step was made. Other concepts coming up during the search and selection process that appeared eligible, were added to the selection of concepts after discussion between the reviewers. See supplementary file 4 for concepts and reason for inclusion/exclusion in the second search step.

In search step 2, between May and September 2018 each of the identified concepts was combined with 'undergraduate nursing students' to find studies operationalizing these concepts in the

literature about nursing students' learning in practice. After these two searches, reference lists were checked for additional publications.

Stage 3. Study selection

Two researchers (MS and RAK) independently screened abstracts from search step 2 and assessed the eligibility for full text retrieval. Selected full-text studies were compared between the reviewers with disagreements being resolved through discussion and consensus and with input from the full research team.

The inclusion criteria were developed iteratively. The initial inclusion criteria were:

- Original research or reviews in peer reviewed journals that have learning in undergraduate clinical nursing practice in the hospital setting as one of their main topics, regardless of publication date and type of article.
- Studies that examine how students learn in the clinical hospital setting

In line with the aim of the study, the inclusion criteria were refined to:

- Original research or reviews in peer reviewed journals, regardless of publication date type of article and study quality, that examine the learning of undergraduate nursing students in the clinical hospital setting as it regularly occurs

Resulting in the following exclusion criteria:

Studies:

- evaluating organizational models or interventions
- about factors influencing learning in clinical practice, including supervision styles, teaching methods and clinical learning environment
- outside the general hospital setting
- about very specific student populations, patient populations or settings (e.g. palliative care) generating results that might be limited to that setting
- about interprofessional learning
- about the acquisition of specific skills
- about student's 'experience' of clinical learning *without explicit reference to the learning process.*

As the study aim was to examine how learning in practice is operationalised in peer-reviewed research, books, book reviews, commentaries, letters to the editor, PhD theses, and reports were excluded.

Stage 4. Charting the data

Selected studies were documented including study characteristics (year, country, methodology, study question, study design, participants, outcomes, study quality), conceptualisation of learning in practice (definitions, theoretical underpinnings/rationale, operationalisations), results, learning activities, and study quality. Although formal assessment of study quality is generally not performed in scoping reviews[9], this is subject to debate[6]. Quality assessment of included studies by the Critical Appraisal Skills Programme (CASP)[13] was decided upon to address qualitative gaps in the literature[8].

Stage 5. Collating, summarizing and reporting results

Data were analysed in two ways. First, descriptive account of concepts, theories, subsequent operationalisations and study quality were given and compared. Second, a data driven thematic analysis of the outcomes of the studies that are relevant for our research questions was conducted (Dixon-Woods, Agarwal, Jones, Young, & Sutton, 2005). To select those outcomes, first learning activities were separated from other study results by going through the result sections of the studies and underlining findings (themes, observations, quotes) that referred to how nursing students learn in the hospital setting. When possible, the used the original wording was used, when necessary we rephrased before further analysis. These findings were categorized using open coding, resulting in six classes of activities. All the results were compared and consolidated through consensus between MS and RAK.

Stage 6. Expert consultation

In order to confirm our findings, we presented our analysis of the learning activities to four experts of different institutions in the Netherlands (one senior clinical educator, one coordinator of clinical education, one head of nursing education department, and coordinator of nursing education) and asked them whether these findings matched with their perspective on clinical learning.

RESULTS

Search results

This initial search to identify concepts yielded 7211 abstracts, of which 5658 remained after removing duplicates. As the two reviewers (MS and RAK) reached full agreement on potentially eligible concepts after screening the first 200 abstracts, the remaining abstracts were screened by MS only. Seventy potentially eligible concepts were extracted. After discussion between the reviewers, 22 concepts were selected, to which three concepts were added later in the process, so the second search was run with 25 different concepts. See supplementary file 4 for concepts and reason for inclusion/exclusion in search step 2. The second search, using the 25 concepts selected in the initial search, generated 9360 results of which 5880 remained after duplicates were removed. For both abstracts and full texts, RAK and MS independently applied inclusion criteria and subsequently discussed their findings, resulting in the selection of 83 abstracts for full text reading and the inclusion of 17 studies (see supplementary file 5 for excluded full texts and reason for exclusion). Three pairs of studies were based on (partly) overlapping data[14-19], but were all included as the results only partly overlapped. Reference list screening of the full text articles did not generate any extra results. See Figure 1 For a flow diagram of search step 2.

General study characteristics

All included studies examined the process of undergraduate nursing students' learning in the clinical setting, as a result of their primary aim or as a significant secondary finding of a broader research question. Six of the studies[16-21] investigated undergraduate nursing students' learning in both the classroom setting and the clinical setting. One of the studies included not only nursing students, but also midwifery and social work students[22]. However, results relevant to our research question could be separated from other findings. All were primary studies, of which sixteen were qualitative studies, and one mixed methods[19]. Publication year ranged from 1987-2018. Studies were conducted in different countries in Europe, Middle East, North America and Oceania.

Study quality

Table 1 shows the quality of the included studies as assessed with the Critical Appraisal Skills Programme (CASP)[13] tool. The mixed method study[19] was also appraised with the CASP, as its focus was on the qualitative data. To summarize, in the majority of studies it was unclear how the results answered the research question, because of a lack of clear aims, lack of clear operationalization, or both, in spite of clear descriptions of the process of data analysis and its outcomes.

	Baraz, et al. [23]	Burnard [18]	Burnard [19]	Carey, et al. [24]	Dadgaran, et al. [25]	Gidman [22]	Grealish and Ranse [26]	Green and Holloway [20]	Kear [16]	Kear [17]	Mannine n [14]	Mannine n, et al. [15]	Mayson and Hayward [27]	Roberts [28]	Seylani, et al. [21]	Stockhausen [29]	Windsor [30]
Was there a clear statement of the aims of the research?	yes	No	yes	yes	no	yes	yes	No	no	no	no	yes	yes	yes	no	yes	yes
Is a qualitative methodology appropriate?	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Was the research design appropriate to address the aims of the research?	yes	can't tell	yes	yes	no	yes	Can't tell	Can't tell	yes	Can't tell	yes	yes	yes	yes	no	yes	yes
Was the recruitment strategy appropriate to the aims of the research?	yes	can't tell	yes	yes	can't tell	yes	can't tell	can't tell	yes	can't tell	can't tell	can't tell	can't tell	can't tell	yes	no	no
Was the data collected in a way that addressed the research issue?	yes	can't tell	can't tell	yes	yes	can't tell	yes	Can't tell	Can't tell	yes	Can't tell	yes	yes	yes	Can't tell	yes	yes
Has the relationship between researcher and participants been adequately considered?	no	can't tell	can't tell	yes	no	yes	yes	No	no	no	no	can't tell	yes	can't tell	no	no	no
Have ethical issues been taken into consideration?	yes	can't tell	Can't tell	yes	yes	yes	can't tell	no	yes	can't tell	can't tell	yes	yes	yes	yes	yes	no
Was the data analysis sufficiently rigorous?	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	can't tell	yes	yes	can't tell	yes	yes	yes
Is there a clear statement of findings?	yes	Yes	No	yes	no	yes	yes	no	yes	yes	no	yes	yes	yes	yes	yes	yes

Table 1. quality of the included studies as assessed with the Critical Appraisal Skills Programme (CASP)[13] tool

Concepts, operationalisations and learning activities

Table 1 summarizes the main concepts, operationalisations, frameworks, findings and learning activities of the 17 selected studies. Findings concerning conceptualisation and operationalisation as well as the results concerning learning activities will be discussed in de following paragraphs.

	Conceptualisation			**Operationalization**	**results**	
	Main term(s) used to describe learning in practice *definition, if provided, in italics*	**Main concept studied** *Definition, if provided, in italics*	**Theoretical or conceptual framework for interpreting results/explicit reference to learning theories**	**Summary of operationalization**	**Findings reported by the authors**	**Learning activities for nursing students in the hospital setting extracted by the reviewers**
Baraz, Memarian, and Vanaki (2014)	Learning process in clinical setting	Learning styles in clinical setting *Individual's preferred methods of knowledge and skill acquisition and information organization.*	No theoretical framework, used, reference to Kolb's stages of experiential learning	Semi-structured interviews about what and how students learn in the clinical setting.	Three clinical learning styles 1. Thoughtful observation 2. Learning by doing 3. Learning by thinking	- careful observation of role models performance - reflective observation during clinical rounds - Participating in medical rounds - clinical rounds - nursing rounds by instructors and classmates - active involvement in procedures - caring for sensitive patients - Active collaboration with peers - maintaining continuity by making active patient contact and repeating nursing procedures - assuming responsibility for patient care - memorizing info by history taking - accountability for clinical homework - inquiring staff and peers - critical thinking

						- monitoring, critiquing, avoiding unsafe practice
Burnard (1992b)	Clinical experiences	Experiential learning *'experiential learning' has been used to describe many different sorts of educational approaches ranging from the use of interactive group strategies) to accrediting people for their life experience when considering those people for entrance to courses*	No theoretical framework, used, reference to Kolb's stages of experiential learning	In depth interviews about how students perceive experiential learning	Definitions of experiential learning: a. something more than just being taught b. something that you use when you use your own experience c learning in the clinical setting	- just doing - just being there - learning by seeing - selecting one of the nurses as a role model - being personally involved and immersed in the learning situation
Burnard (1992a)	Clinical experiences	Experiential learning No definition provided with justification: *'it appears that the term can be used by different people in different ways'*	No theoretical framework, used, reference to Kolb's stages of experiential learning	Interviews about how students and tutors experience experiential learning and questionnaire about perceptions of experiential learning	Experiential learning 1. is learning by doing 2. is personal learning 3. involves reflection Students mostly relate experiential learning to learning in the clinical setting.	- learning by taking part - not only doing but also reflecting. - observing role models
Carey, Chick, Kent, and Latour (2018)	Learning in clinical settings/ learning within the clinical practice environment; Clinical learning	Peer assisted learning *in which students acquire skills and knowledge through the active help provided by status equals or matched*	-	Observation of interaction patterns between students	Three themes contributing to impact of peer assisted learning: - peers as facilitators to develop learning - working together as peers to develop clinical practice and deliver care - positive support and interaction from peers to enhance networking	- watching demonstrations by other students - asking questions - seeking advice and guidance - discussing development plans - discussing practice standards - challenging each other's knowledge - Sharing roles

		companions (Topping, 2005).			and develop working structure.	- sharing experiences of clinical practice - discussing challenges of finding one's way in the clinical environment
Dadgaran, Parvizy, and Peyrovi (2012)	Clinical learning	Clinical learning	-	semi-structured interviews about how students experience their clinical learning; subsequent observations of students in the clinical setting with a focus on interactions	Five categories and one 'core variable': 1. facing unfavourable clinical facts 2 analysis of a clinical situation and appropriate decision making 3. bridging the gap between practice and theory 4. struggle for clinical independence 5. Dynamism 6. struggle to acquire clinical competence Two approaches to learning: 1. Microlearning 2. Macrolearning	- trying to figure out what regulations are and what they should be through detection of the environment - modify learning deficits to fight the feeling of being unable to answer questions - try to analyse the situation and make an appropriate decision - increase theoretical knowledge through reading books and asking questions - in the ward, review already learned materials (reconstructive thinking) - analysis of clinical issues (clinical reasoning) - making links between theory and practice - design care plans - organizing care on the basis of self-made care plans - doing tasks independently
Gidman (2013)	Learning in practice,	Learning from patient stories	No theoretical framework, used, reference to Eraut's theory on informal learning	Conversational interviews about students' perceptions of their learning experiences of listening to patient stories.	1. Students value listening to stories for learning 2. students develop relationships with patients 3. students learn from the subjective and emotional perspective of patients 4. students think back to their own personal stories when caring for	- listening to patients' personal stories - building relationships with patient - listening to relatives of a patient - reflecting on personal experiences

					patients 5. listening to stories has a positive impact on understanding patients and a commitment to patient care.	
Grealish and Ranse (2009)	learning in the workplace, clinical learning	Learning in the clinical workplace	Community of practice	Students' written narratives about where they learned while on clinical placement.	Three thematic constructs, called 'learning triggers': a. participation (or observation) of a task or procedure that leads to (takes them into) a complex, dramatic reading of nursing work b. being personally (emotionally) confronted by the work (high challenge) c. meeting nurses who contribute to the development of an image of what the students wants to be as a nurse	- being involved in the practical aspects of caring for a patient - shifting focus from the task to the person - talking to patients' relatives - looking at the patient as a person, taking an interest in their needs - engaging in post-operative observations - assisting patients in little things - giving medications - Being personally (emotionally) confronted by the work - experiencing positive and negative emotions - taking responsibility - talking to patients - meeting nurses who contribute to the development as an image - identifying a resident nurse as a role model - receiving feedback from resident nurses - aligning personal practice with what is observed - working independently in a supportive surrounding - witnessing poor practice
Green and Holloway (1996)	Learning in the clinical setting	experiential learning	No theoretical framework, used,	Non-directive interviews about students'	6 themes: a. Students were able to define experiential learning, usually	- working with the client (including the intuitive element) - participating, interacting, shared

			reference to Kolb's stages of experiential learning	understanding, experience and interpretation of experiential learning.	encapsulating both classroom and clinical experience. The importance of the experience itself appeared fundamental. b. Role play is identified as the main example of experiential teaching and learning. c. Students were aware of the issues arising from the problematic relationship between theory and practice. d. The importance of reflection as a stage in experiential learning and of reflective practice was highlighted indicating diversity in application. e. Concerns regarding clinical practice. f. The importance of clinical supervision viewing it as experiential learning.	learning with peers. - evaluating nursing models - reflecting. - sharing experiences. - selecting from previous experience to contribute to new ones - practicing of skills - practicing with people. - patient care - non-threatening supportive collaboration with a colleague - learning form practice and reflection - involving clients - reflecting in the form of a portfolio - maintaining personal journals
Kear (2009)	Clinical experience	transformative learning *The process of critically reflecting upon previous assumptions or understandings in order to determine whether one still holds them to be true or challenges their claims (Mezirow).*	Transformative learning	Students' stories about how they experienced their learning	Upon analysis of the narrative data, five threads emerged from the interviews with the participants. 1) Stories of the multi-faceted process of learning 2) Stories of experiential learning 3) Stories of human interactions as central to defining nursing and caring 4) Stories that intertwine personal life experiences and nursing 5) Stories of transformative learning	- creating a connection between clinical experience and classroom material - utilizing peers - learning how to do things - meeting patients with their own stories - looking things up in one's books - providing end-of-life care - caring for a paediatric cancer patient and seeing graduate nurses let her do it in her own way - learning to understand the needs of patients that are unable to communicate - observing other nurses to

						determine what kind of nurse they want to be (both negatively and positively) - just spending time with patients - observing patient situations that were unjust or nursing care that was viewed as sub-optimal
Kear (2013)	Clinical experiences	transformative learning *Changes in meaning perspectives that have developed over an individual's lifetime based upon their life experiences (Mezirow, 2000).*	Transformative learning	Students' stories about how they experienced their learning	Upon analysis of the narrative data, five threads emerged from the interviews with the participants. 1) Stories of the multi-faceted process of learning 2) Stories of experiential learning 3) Stories of human interactions as central to defining nursing and caring 4) Stories that intertwine personal life experiences and nursing 5) Stories of transformative learning	- creating a connection between clinical experiences and classroom material - Interacting with others in the clinical environment - understanding patients' needs by interacting with them - observing nurses to determine what kind of nurse they want to be - providing end-of-life care
Manninen et al. (2013)	learning process in clinical practice; learning through participation and dialogue; learning in clinical practice; learning at a clinical education ward	Experiences of learning at a clinical ward	Authenticity and transformative learning	semi-structured interviews of how students experienced their encounters with others.	Two main themes: a. mutual relationship b. belongingness	- creating a relationship with patients by meeting them independently - listening and communicating with the patient/ adjust communication to the individual patient's capacity and needs - involving the patient in the nursing process by identifying the patient's own resources - Learning from making failures - handling difficult situations and feelings - collaborating with physicians, physiotherapists, other

						professionals and other students - working together with other students, discussing patient care, sharing experiences giving support, informing and showing
Manninen (2016)	Learning in clinical practice	Nursing students' learning in relation to encounters with patients, supervisors, peer students and other healthcare professionals.	transformative learning and concepts of authenticity and threshold	Semi-structured interviews and group interviews of students' experience of their learning with a focus on their encounters with others. Observations with follow up interviews about student-patient encounters and about supervision.	The results show that the core of student meaningful learning is the experience of both external and internal authenticity. External authenticity refers to being in a real clinical setting meeting real patients. Internal authenticity is about the feeling of belonging and really contributing to patients' health and well-being.	- creating mutual relationships - taking care of patients with extensive needs for nursing interventions.
Mayson and Hayward (1997)	Clinical practice experiences	Learning from hidden curriculum *Hidden curriculum involves the experience and application of theory and the wider social context relates to the practice development.*	hidden curriculum	semi-structured interviews about clinical areas and persons that have been beneficial for students' learning, as well as descriptions of their learning.	*Given a lack of a summary of important themes, I extracted these findings myself* 1. caring relationship is central for nursing; relationships with patients are significant experiences 2. Registered nurses and tutors are contributors to students' learning if they include students 3. students actively seek positive experiences 4. Peers play a significant role in learning 5. importance of being part of the ward team, facilitated by the ward	- Working in the medical/surgical areas. - Talking with/ listening to clients - helping/ making a difference for the patient - looking at positive role models - sitting together with peers/talking to peers about experiences. - watching supervisors on nursing skills and communication skills

					nurse 6. theory-practice gap	
Roberts (2008)	Clinical learning; informal on-the job learning	Peer learning *Peer learning involves students learning from each other*	No theoretical framework, used, reference to Eraut's theory on informal learning and Melia's theory of professional socialization	observation of students in clinical practice with a focus on peer interactions	Themes: a. value placed on friendships and learning in clinical practice. B. students learning survival skills (implicit and explicit rules) c. developing clinical skills	- working alongside other students. - passing along implicit rules - making mistakes/ being pulled up/called about them - sharing clinical skills - asking other students for help. - teaching other students, regardless of year of study.
Seylani et al. (2012)	Clinical experiences	Informal learning *Informal or indirect learning can occur as a function of observing, retaining, and replicating behaviours during educational experiences*	-	semi-structured interviews about what changes students experienced during their study apart from theoretical and practical knowledge.	Five categories of students' experiences: a. personal maturity and emotional growth, b. social development c. closeness to God d. alterations in value systems e. ethical and professional commitments	- Frequent personal interactions - developing relationships - frequent exposure to life and death situations - interacting with others. - caring for people with different religious beliefs - learning from patients struggling with chronic illness - continuously engaging with people who need help - seeing patients suffer - communicating with patients - caring for the most vulnerable - confronting the light and dark sides of life
Stockhausen (2005)	learning in the workplace	learning in the workplace	No theoretical framework, used, reference to Kolb's stages of experiential learning	Students' journals and reflective group debriefings comprehending reflections on clinical experiences.	Themes a. Entering the world of the patient b. Clinicians making a difference c. Constructing an identity as a nurse	- learn through the patient's experience - reacting to and deciphering emotive non-verbal cues from the patient as they care for them. - interacting with the patient - reflectively interpreting experiences with the patient.

						- sharing and developing everyday nursing practices with the RN - constructing their own schemata of admirable qualities the RN displays - picking up little tips from the RN/ little things that she does. - listening to RNs - confirming their nursing practices and assimilating theoretical and clinical knowledge - practicing skills - doing what it is it that nurses do - activities such as making a bed or showering a patient when considered from a student's achievement perspective. - Engaging with the activities of nursing - Making comparisons and discriminations of practices
Windsor (1987)	Learning in the contextual setting of clinical practice	clinical learning experience		Focused interviews about how nursing students perceive their clinical experiences.	Main categories of learning: nursing skills, time management, professional socialization. A pattern of student development through three phases	- practicing nursing skills - going back to books and journals - poring over chart for hours - consulting other health care providers - writing papers - observing nurses and participating in nursing functions - preparing for clinical practice including meeting patients, reading charts, studying patients' health needs, consulting staff. - Caring for lots of different patients with different diseases, different kinds of wards, variety of instructors, working with different equipment.

						- Working more subsequent shifts with the same patient - asking question without feeling embarrassed - asking questions to their peers

Table 2. Main concepts, operationalisations, frameworks, findings, learning activities of the included studies

Concepts

To analyse how learning in practice was approached we compared the main concepts of study, usually reflected in the aims of the paper. Five of the papers studied a concept that was a synonym for learning in clinical practice such as learning experience or workplace learning [15 25 26 29 30]. However, in none of these studies the concept was defined or justified. The remaining eleven studies examined a specific concept related to learning in general, which was studied within the context of clinical practice. In four of the studies this concept concerned social learning, either in general, or from specific groups that are naturally present in the nursing ward [14 22 24 28]. In five of the studies, the non-conscious, unplanned nature of learning was explicitly targeted by the concepts of experiential, informal, and hidden curriculum learning[18-21 27]. The remaining studies focused on the active role of the student in learning by investigating learning styles[23], or a specific combination of both the process and effects of learning as reflected in the concept of transformative learning[16 17].

Theoretical frameworks

The five studies that used a theoretical or conceptual framework to structure the study, used Wenger's community of practice[26] or Mezirow's transformative learning[14-17]. Three of the studies tried to extend on existing theories using a grounded theory approach[18 19 25]. The remaining nine studies discussed their research questions and findings in the light of previous literature relevant for their specific study[20 21 29 30], some of them referring to theories about learning such as Eraut's theory of informal learning, Melia's theory of professional socialization[28], or Kolb's learning cycle[18-20 23 29]

Operationalisations

Nine studies used interviews, narratives or both to address students experiences of learning in general[16 17 23 25-27] or specifically learning from interactions[14 15 22]. The different approaches shared a semi-structured nature, in which a few main topics were introduced by the researcher, to which students could bring up their ideas and experiences. Some authors[18-20] combined an exploration of what students understood by experiential learning, with an examination of their actual experiences in experiential learning. Finally, in three of the studies, learning was operationalized by the observation of interactions between nursing students and peers or colleagues that play a role in learning[14 24 28].

Comparison of conceptualisations

Most of the studies, apart from the ones that focus on social interactions, adopted a very open approach to examine learning in practice, irrespective of the concepts and theoretical frameworks used. This resulted in a variety of overlapping outcomes. Together with the small number of studies, a thorough comparison of the suitability of different concepts can therefore not be made.

Study results: Learning activities

The thematic analysis allowed us to extract the following classes of activities that are observed or reported to contribute to learning during the daily presence of students in the nursing ward.

a. Working as a nurse
b. Interacting with ward staff
c. Interacting with peers
d. Interacting with patients
e. Processing Information

a. Working as a nurse

Students learn by actively engaging in nursing practice, including gaining responsibility for designing care plans[25], organizing care, practicing skills and delivering patient care themselves[16 18-20 23 25 26 29], within a supportive environment[26]. Several studies explicitly report how the importance of working independently evolves throughout training [14 15 25 30]. It should be noted that this theme may overlap with the other themes, and might reflect a more general characteristic of learning in practice.

b. Interacting with ward staff

Students learn by observing both good and poor examples of registered nurses, listening to them and choosing which one could serve role model[16-19 21 23 26 27 29 30]. Students learn from other professionals on the ward, for example by listening to their discussions during rounds[15 23 30] or receiving feedback [26]. Beside observing nurses, students learn from sharing their work experiences with resident nurses and questioning them[23 25 29 30].

c. Interacting with peers

Students learn from peers by working together, questioning each other, sharing experiences, observing each other at work[6 20 23 24 27], and teaching each other[28]. They pass on implicit rules by asking advice and guidance. Through discussing standards in practice, development plans and practical issues they challenge each other and expand their knowledge[24]. Through dividing the work between them, students optimize their exposure to different learning situations[24].

d. Interacting with patients

Listening to patients and building relationships is reported as an activity that students learn from[14-16 20 22 26 27]. More specifically, caring for patients who have different religious beliefs, communication problems, extensive needs, or chronic illnesses or visibly suffer contribute to students' learning[14-16 21

[23 29] as well as providing end-of-life care[16 17 21]. As concrete activities, involving the patient in the nursing process was regarded to be valuable[15] as well as assisting them with little things[26], giving medication, doing post-operative observations, or performing simple tasks such as making a bed, as long as they can be done independently[26].

e. processing information

A final class of activities refers to how students look up, process, and store information related to patient care and their learning process. Reflecting on nursing practice promotes learning[18-20 23 29], sometimes supported by a journal or a portfolio[20]. More specifically, students reflect by analysing and comparing nursing practice and thinking how to improve it, making connections with theory and previous experience[16 17 23 25 29]. Negative experiences such as not being able to answer questions, witnessing poor practice, making mistakes, and emotion evoking encounters, stimulate students to reflect and expand their knowledge and skills[15 16 21 26 28]. Students benefit from going through textbooks[16 25 30] and patient charts[23 30], as a preparation for the shift for activities such as patient education.

Expert consultation

All four experts acknowledged the synthesized learning activities as the core of clinical training. One of them added a nuance that some activities automatically promote learning ('learning by doing'), while others require support by staff (e.g. 'peer learning'). Moreover, one of them noted that experiences may only result in learning after the learning has been made conscious. Compared to their ideal vision of practice learning, another expert missed the active role of the student in creating learning opportunities, as well as formalized elements of learning, such as the formulation of learning goals and the elaboration of theory learned in school. However, this was something they missed in their own daily practice as well. Finally, two experts noted that the 'supervisor' role of the resident nurse was referred to minimally; it appeared that resident nurses were primarily observed as role models. Two of the experts were surprised by the notion that negative experiences are repeatedly mentioned as learning opportunities.

DISCUSSION

This study aimed to provide insight in conceptualisations of 'learning in practice' in the nursing education literature, as well as in their operationalisations and outcomes in terms of learning activities. Five of the 17 reviewed studies adopted a general, yet unexplained, synonym for learning in practice as their object of study, the others approached learning in practice focusing on the social, unplanned, and active nature of learning. These foci are in line with the broader literature on practice learning in healthcare education[3 31]. Regardless of conceptualisations, all studies adopted a qualitative approach, resulting in various, yet overlapping themes. A closer examination of learning activities that were reported throughout the results, revealed six classes of activities.

Our eventual aim was to make suggestions about the use of terminology in future research. The small number and poor to medium quality of the studies hindered a thorough comparison between concepts. There were often missing links in the alignment between concepts, study aims, operationalization and conclusions, resulting in a variety of results that were often difficult to relate to their original study question. Moreover, the sparse use of theoretical frameworks hindered an aggregation of findings[32]. Therefore, a recommendation is to explain and justify the concepts of study based on previous literature, and critically evaluate findings in the light of these specific terms. Alternatively, a further exploration of the meaning of a concept itself can advance the field. However, caution has to been taken in exploring the meaning of a concept and simultaneously studying participant's experiences with the same concept, as some of the studies did[18-20].

Not surprisingly, the informal or hidden nature of clinical learning was frequently referred to. As this learning occurs partly unconsciously, it is a challenging subject to define and to study[33]. In the current studies, informal learning was addressed by what it is *not* (i.e. theoretical and practical knowledge)[21], and hidden curriculum was described by learning resources that were *not* reported by particapants[34]. Formal or formalized activities in the clinical area (such as peer teaching and doing 'clinical homework'), were not labelled as such. As both formal and informal learning coexist in the practice setting[35] and the dichotomy between the two has been questioned[36], clear definitions of these concepts are required, with which the different activities that student engage in throughout the day can be classified.

In most of the studies, potential or desirable learning outcomes were not articulated, and were not separated from outcomes such as professional identity formation or wellbeing. Studies that did include the intended effect of learning in their definitions, as those of Kear [16 17], did not critically revisit if these outcomes were indeed reported. Obviously, examinations of the relationship between learning and subsequent outcomes can be found in literature addressing particular outcomes (such

as skills learning)[37] or about assessment[38], which we excluded. Moreover, the lack of predefined outcomes might be a characteristic of clinical learning[39]. However, also in literature addressing complex learning processes such a clinical learning, a critical discussion of actual and desirable outcomes, is warranted.

The analysis of learning activities is congruent with literature on the importance of increasing independence[40], interaction with others[41], learning from authentic situations with patients[42], and reflection[43] as well as with experiences from our expert panel. In the reviewed studies, the interactions between concrete behaviours and cognitive processing were not systematically addressed, which resulted in separate categories in our analysis. According to constructivist learning theories and as was commented by our experts, the social, behavioural and cognitive domains of learning go hand in hand[44]. Some of the study results did reveal this interaction, such as students reflecting on how they turned negative experiences into learning. Systematically acknowledging interactions between behaviour and cognition, in the terminology as well as in the methods, will contribute to our understanding of how and when individual students learn. Caution has to be taken though in labels such as 'learning styles' as one of the studies[23] did, in the absence of an accurate test of the premise of this interpretation. Finally, the appreciation of the learning potential of more negative experiences, calls for a shift in focus from factors influencing the clinical learning environment, to students' active role in clinical learning.

Limitations

The variety of concepts, processes, definitions and outcomes associated with learning in clinical practice proved challenging in determining the boundaries of our search. The selection was influenced by choice of terminology and framing of the authors of the studies. This review therefore provides insight into the current use of terminology as well as caveats in applying it. Limiting to nursing in the hospital setting excluded us from both theoretical and experimental research on practice learning in other health professions. However, this focus enabled us to synthesize specific findings from the different studies. The approach can be of interest for other health professions, and will eventually allow for comparison of the literature. Finally, our synthesis of learning activities is based on studies with heterogeneity in populations, setting, and year of publication, in which the same type of activity might have a different meaning. As we reinterpreted some of the data caution has to be taken in drawing firm conclusions[45]. Nevertheless, as the findings were recognized by experts and correspond with existing literature, the categories found are a good starting point for further study.

Conclusion

This review provides an overview of how learning in clinical practice has been addressed in the undergraduate nursing education literature. The number of studies that investigate examine how students learn during their days at the ward remains scarce and the quality of studies conducted is circumspect. Moreover, these studies often fail to align theoretical concepts with a corresponding operationalization and analysis of findings, therefore offering little guidance for which terminology to use in future studies. The studies on this topic reveal the importance of increased autonomy, learning form, peers, professionals and patients, and the cognitive appraisal of learning. This categorization may be a basis for the design and evaluation of clinical learning. There is still uncertainty about formal and informal components of learning and how they should be studied, as well as about desirable outcomes of clinical learning and how to incorporate them in research. Given the importance of students' active engagement with learning as well as reflection on it, behavioural and cognitive aspects of learning as well as their interactions should be explicitly addressed.

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FUNDING

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

COMPETING INTERESTS

The authors declare that they have no competing interests.

CONTRIBUTORS

MS, RAK, HED, SP, JCFK contributed to the research idea and study design and edited and revised the paper. MS and JCFK developed the search strategy and executed the search. MS and RAK identified and agreed eligible papers and extracted the data. MS wrote the manuscript. RAK led the supervision of the project.

PATIENT CONSENT

Not required.

DATA SHARING STATEMENT

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

FIGURES

Figure 1. Flow diagram article screening and selection search step 2

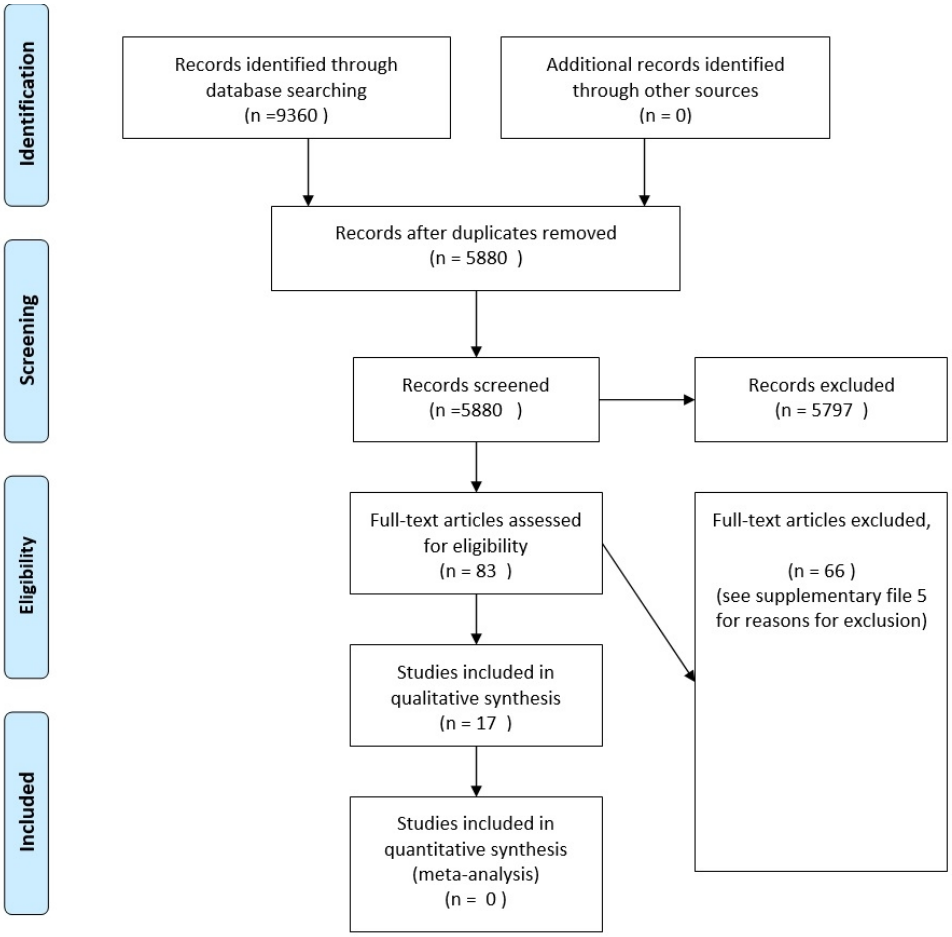

Figure 1. Flow diagram article screening and selection search step 2

245x229mm (96 x 96 DPI)

PRISMA-ScR Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable) background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions or objectives lend themselves to a scoping review approach.	3
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (for example, population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions or objectives.	3
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (for example, a Web address); and if available, provide registration information, including the registration number.	4
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (for example, years considered, language, and publication status), and provide a rationale.	5
Information sources	7	Describe all information sources in the search (for example, databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	4 + supplementary file 3
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Supplementary file 3
Selection of sources of evidence	9	State the process for selecting sources of evidence (that is, screening and eligibility) included in the scoping review.	5
Data charting process	10	Describe the methods of charting data from the included sources of evidence (for example, calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	6
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	6
Critical Appraisal of Individual Sources of Evidence	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	6
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	N/A
Synthesis of results	14	Describe the methods of handling and summarizing the data that were charted.	6

PRISMA-ScR Checklist

Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	N/A
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	N/A
RESULTS			
Selection of Sources of Evidence	17	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	7
Characteristics of Sources of Evidence	18	For each source of evidence, present characteristics for which data were charted and provide the citations.	7
Critical Appraisal Within Sources of Evidence	19	If done, present data on critical appraisal of included sources of evidence (see item 12).	7-8
Results of Individual Sources of Evidence	20	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	9-18
Synthesis of results	21	Summarize or present the charting results as they relate to the review questions and objectives.	19-21
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	N/A
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	N/A
DISCUSSION			
Summary of evidence	24	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	22
Limitations	25	Discuss the limitations of the scoping review process.	23
Conclusions	26	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications or next steps.	24
FUNDING			
Funding	27	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	26

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, Moher D, Peters MDJ, Horsley T, Weeks L, Hempel S, Akl EA, Chang C, McGowan J, Stewart L, Hartling L, Aldcroft A, Wilson MG, Garritty C, Lewin S, Godfrey CM, Macdonald MT, Langlois EV, Soares-Weiser K, Moriarty J, Clifford T, Tunçalp Ö, Straus SE. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Ann Intern Med. 2018.

Protocol for a scoping review on the conceptualization of learning in undergraduate clinical nursing practice

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Word count

2385

Key words

Undergraduate nursing education, learning in practice

ABSTRACT

Introduction: Learning in the clinical setting is a major form of learning in undergraduate nursing education. In spite of this, how nursing students learn in clinical practice is still largely unknown. Moreover, there is no conceptual clarity on learning in practice in the current literature. This paper aims to set up a protocol for a scoping review of the literature in order to map different conceptualizations of learning in undergraduate clinical nursing practice in the hospital setting. The operationalisations of different concepts will be compared and the findings of the studies will be synthesized.

Methods and analysis: This scoping review will be guided by the methodological framework proposed by Arksey and O'Malley and refined by Levac et al. and the Joanna Briggs institute. The search strategy will be developed together with a medical information specialist and the search will be performed in electronic databases (PubMed, EBSCO/ERIC and EBSCO/CINAHL). In a first search, we will identify concepts that are used as an equivalent to learning in practice. Next we will search for studies operationalizing these concepts in undergraduate nursing education. Finally, we will check reference lists for additional publications. Abstracts and full-text studies will independently be screened by two researchers. All studies that have 'learning in undergraduate clinical nursing practice' as their main topic and that include a definition of operationalization of an equivalent to learning in clinical practice, will be considered for inclusion. We will chart different conceptualisations and their theoretical underpinnings, as well as reported learning opportunities, informal and formal aspects of learning, social aspects of learning and gaps in the literature.

Ethics and dissemination: This review will help design future studies on learning in clinical nursing practice using well-defined and agreed upon terminology. The results will be disseminated through journal publications and conference presentations.

ARTICLE SUMMARY

Strengths and limitations of this study

- This protocol outlines a rigorous design that includes an established research framework, a search strategy and a selection process.
- The search strategy includes different databases with peer-reviewed literature, with no restrictions to the study design or the publication date.
- The assessment of the quality of the included papers will enable identifying gaps in the literature.

- A limitation is that the literature search will only cover undergraduate nursing education, while a comparison with literature on learning in practice in other health professions would enrichen our understanding of potential conceptualizations.
- This study will not include books or grey literature, which will allow us to map how learning in practice is conceptualized in original research.

INTRODUCTION

Learning in the clinical setting is crucial for becoming a competent nurse[1]. However, how nursing students learn in clinical practice is still largely unknown. A vast body of knowledge exists on factors that influence learning, but the process itself remains underexposed [4]. For example, there is a lack of insight into how individual learning outcomes can be predicted, or which learning opportunities best promote students' learning [5]. Understanding learning in the clinical setting can help design, supervise and evaluate individual learning trajectories and their outcomes in practice. This study aims to set up a protocol for a scoping review to examine how different concepts that are equivalent to 'learning in practice' are used and operationalized in the literature, and what these studies add to our understanding of learning in the clinical setting

In the educational literature, the concept of 'learning in practice' has been widely studied in the context of workplace learning by professionals [6] or practice learning by students[7]. However, there is no unified definition or approach towards this concept[8]. Two main characteristics of clinical learning can be clearly distinguished in the literature. First, learning in practice is often distinguished from learning in the classroom setting as informal opposed to formal learning, where informal learning arises in situations where learning is not the primary aim[9]. However, some authors question the validity of a dichotomy between formal and informal learning[10], and state that every learning situation contains both formal and informal elements[11]. This would particularly apply to clinical learning, which is characterized by a constant interplay of the 'reality' of clinical practice and formal learning interventions such as feedback and assessment[12]. Another essential characteristic of workplace learning is its social rather than individual nature[13]. That is, learning occurs in interaction and dialogue with others [9].

In the nursing education literature, just as in other health professions education literature, different terms are used to describe and study learning in clinical practice, with different theoretical underpinnings. Moreover, the rationale behind the application of the concepts used is not always explained. Therefore, it is not always clear whether these different terms refer to the same concept, and how they are defined in terms of learning content (skills, knowledge, values), process (implicit,

explicit), control (intended or unintended, guided or not guided) and learning outcomes. Also, different researchers appear to apply the same concept differently. Having clear and agreed upon terminology can help design future studies that can contribute to understanding learning in clinical practice along with its limitations so that nursing wards can be organized for optimal benefit of the students.

The goal of this scoping review is to provide guidance for the use of concepts that describe learning in undergraduate clinical nursing practice in future studies. This study therefore aims to examine how different concepts that are equivalent to 'learning in practice' are used and operationalized in the literature. Therefore, we will look for studies that examine how learning in the clinical setting takes place. To enable comparison of the use of different concepts, we will focus on the general hospital setting. This context is the traditional setting for nursing training and comprises a variety of factors that may be relevant for learning, such as the presence of registered nurses, peers, and other professionals, as well as complex and acute patients, thereby offering a wide array of multidimensional learning opportunities [14]. We will particularly consider how formal and informal aspects of learning, as well as the social component of learning are included in these operationalisations. We will synthesize the results relating to how students learn in clinical practice.

A body of work on concepts to describe learning in practice does exist outside nursing education literature[15]. To our knowledge, the only study that included distinct concepts of learning in clinical practice in a review before, was a concept analysis of work-based learning in health care education by Manley, et al. [16]. The authors identified common attributes, enabling factors and consequences of workplace learning and proposed a definition. The current review will build on this work by closely examining different concepts of learning in practice in the context of undergraduate nursing education, as well as comparing how they are used to study clinical learning. This will enable us to address gaps in the literature as well as make suggestions for the use of terminology in future studies Also, the current study will include literature after 2009 when Manley, et al. [16] conducted their study. In interpreting our findings, we will consider the broader body of literature on learning in practice.

METHODS AND ANALYSIS

We decided to use the scoping review approach to map the different concepts that are used to study learning in clinical nursing practice as well as the way they are operationalised and the information they provide about how students learn in the clinical setting. Since the lack of a focused line of inquiry requires a broad research question, we consider a scoping review to be more appropriate than a systematic review. Scoping can help understand complex concepts through clarifying

definitions and conceptual boundaries[17]. Scoping will also enable us to identify key concepts, gaps in the literature, and types and sources of evidence to inform practice, policymaking, and research[18]. To get a comprehensive picture of the existing research, we will include studies with different designs. Since scoping reviews are hypothesis-generating rather than hypothesis-testing, this review can provide a stepping off point for further research.

Standardized reporting guidelines can help the critical appraisal of reviews and thereby increase their reproducibility, completeness, and transparency[19]. For systematic reviews, the PRISMA-P checklist has been developed to facilitate the preparation of a robust research protocol[20]. PRISMA guidelines for scoping reviews are still under development[21]. We therefore used relevant items of the PRISMA-P (Preferred Reporting Items for Systematic Reviews and Meta-analysis Protocols) to draft this protocol, as outlined in additional file 1.

To ensure rigor in reporting the methodology, we will use the six-stage approach developed by Arksey and O'Malley [22] and refined by Levac, et al. [23] and the Joanna Briggs institute [24] (1) identifying the research question; (2) identifying relevant studies; (3) selecting studies; (4) charting the data; (5) collating, summarizing and reporting the results; (6) expert consultation (optional and included).

Stage 1. Identifying the research question

Since our aim is to understand how learning in undergraduate clinical nursing practice is conceptualized in the current literature irrespective of research design and outcome, our research question is:

- How are different concepts that are used as an equivalent to learning in the hospital setting operationalized in the undergraduate nursing education literature?

As scoping is an iterative process [22], we might add additional questions based on our findings along the review process. While the eventual goal of this study is to contribute to the understanding of the process of nursing students' learning in practice, we will also synthesize results that are relevant to this topic.

Stage 2. Identify relevant studies

The search strategy will be iteratively developed by the research team. As suggested by the Joanna Briggs institute [24],we will start with a very broad search to inform our subsequent search strategy. A comprehensive search strategy will be developed (by MS and JCFK) to conduct this stepwise search

process following the Peer Review of Electronic Search Strategies (PRESS) 2015 guideline statement [25].

In an initial search (search step 1), we will combine the terms 'learning in clinical practice' and 'undergraduate nursing students'. The search query for both steps will first be developed for PubMed and later extended to EBSCO/ERIC and EBSCO/CINAHL to identify different concepts in the literature that are used as an equivalent to 'learning in clinical practice' by nursing students. See our draft search in the additional file 2 for step 1 of our search. The first 100 search results from each database will be reviewed by the researchers to assess validity of the search strategy. When agreement has been reached about the initial search strategy, the first 200 abstracts will be scanned by the two reviewers (MS and RAK) on concepts potentially eligible for inclusion in the second search step. Eligible concepts are concepts that describe the process of learning to become a nurse within the clinical context ('such as 'experiential learning' or 'informal learning'), rather than specific aspects or (such as 'skill acquisition' or 'peer learning'). In case of full agreement between the two reviewers on potentially eligible concepts, the first reviewer will screen the rest of the abstracts. In case of disagreement, the second author will scan another 200 abstracts until full agreement is reached. After all abstracts have been screened, the two reviewers will discuss all potentially eligible concepts and select concepts to be included in the second search step.

After having selected the different concepts, we will develop a search query (search step 2) in PubMed and subsequently extend to EBSCO/ERIC and EBSCO/CINAHL combining each of the identified concepts with 'undergraduate nursing' to find studies operationalizing one of the identified concepts in the literature on nursing students' learning in the hospital setting.

After these two searches, we will check reference lists for additional publications (See figure 1 for a flow diagram of the search and selection process). We will conduct the two searches in June 2018.

Stage 3. Study selection

Following the second step of our search strategy, two independent researchers will screen abstracts and assess the eligibility for full text retrieval. Selected full-text studies will again be compared between the reviewers with disagreement being resolved through discussion and consensus and with input from the full research team.

The inclusion criteria will be developed in an iterative process in which the reviewers calibrate a threshold for inclusion and exclusion. The initial inclusion criteria will be:

- Original research or reviews in peer reviewed journals that have learning in undergraduate clinical nursing practice in the hospital setting as one of their main topics, regardless of publication date and type of article.
- Studies that examine how students learn in the clinical hospital setting

Since we are interested in how learning in practice is operationalized in peer-reviewed research, we exclude books, book reviews, commentaries, letters to the editor, PhD theses, and reports. Reasons for exclusion will be documented at the full-text review stage.

Stage 4. Charting the data

Data will be extracted from full-text journal articles which meet the aforementioned inclusion criteria. A draft analytic frame is developed to document selected studies into an excel spreadsheet, including study characteristics (year, country, methodology, study question, study design, participants, outcomes, study quality), conceptualization of learning in practice (definitions, theoretical underpinnings/rationale, operationalisations, formal/informal aspects of learning, social interactions, learning opportunities)and reported gaps in the literature. Other categories that come during the data extraction progress will be discussed in the research team and added to the data extraction form. Although formal assessment of study quality is generally not performed in scoping reviews [24], some claim it should be incorporated in the methodology [18]. Assessing study quality will enable us to address not only quantitative, but also qualitative gaps in the literature[23]. We will therefore assess the quality of included studies by a set of quality indicators for reviews developed by Buckley, et al. [26].The form will be piloted on 5–10 articles by the team and will allow us to analyse the selected articles through a common framework.

We will document studies that are not selected for full text retrieval in a separate file. To ensure accurate data collection, each reviewer's independent charted data will be compared and any discrepancies will be iteratively discussed by the researchers to ensure consistency between the reviewers.

Stage 5. Collating, summarizing and reporting results

A PRISMA flow diagram will be used to report final numbers in the resulting study publication. As we expect a diverse body of knowledge, we will give a descriptive account of concepts and subsequent operationalizations. We will synthesise study findings using narrative descriptions based on themes that emerge from the extracted data. The results will be compared and consolidated through consensus between two of the r MS and RAK.

We will address both quantitative and qualitative gaps in the literature. We will discuss the data in the light of relevant theories on workplace learning both in and outside nursing education literature and make suggestions for the operationalization of learning in practice for future studies.

Stage 6. Expert consultation

In order to confirm our findings and interpretations, two nurse educators, with experience in scientific research and expertise on learning in clinical practice, will be approached for consultation.

ETHICS AND DISSEMINATION

This scoping review will be the first study to compare terminology used for learning in undergraduate nursing clinical practice and thereby will contribute to the design and comparison of future studies in this field. This protocol reports a comprehensive, rigorous and transparent methodology. The results will be disseminated through a peer-reviewed publication and national and international conferences such as the AMEE (Association of Medical Education in Europe) conference, targeting an audience involved in undergraduate nursing education. By identifying gaps in the current body of literature, this study can guide future nursing education research. Both the methodology and the results may be of interest for researchers and educators in other health professions than nursing, given the widely spread importance of learning in clinical practice. Since the methodology applied consists of reviewing and collecting data from publicly available materials, this study does not require an ethical approval.

PATIENT AND PUBLIC INVOLVEMENT

- *How was the development of the research question and outcome measures informed by patients' priorities, experience, and preferences?* As education is essential for improving patient care, patients will eventually benefit from the body of knowledge this study contributes to. However, specific interests of patients have not been examined.
- *How did you involve patients in the design of this study?* Patients have not been involved in the study.
- *Were patients involved in the recruitment to and conduct of the study?* No.
  How will the results be disseminated to study participants? As this concerns a review, this study has no participants.
- *For randomised controlled trials, was the burden of the intervention assessed by patients themselves?* Not applicable
- *Patient advisers should also be thanked in the contributorship statement/acknowledgements.* Not applicable
- *If patients and or public were not involved please state this.* Not applicable

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AUTHOR STATEMENT

MS and RAK were responsible for the initial design of this study MS, HED, RAK, SP, JCFK, contributed to the development of the eligibility and data extraction criteria JCFK, MS, HED, RAK, developed and executed the search strategy. MS and RAK are responsible for abstract and full-text screening. MS conceptualized the review approach and led the writing of the manuscript. MS, RAK, HED, SP, JCFK contributed and approved the final version of this protocol. RAK led the supervision of the manuscript preparation.

FUNDING

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

CONFLICT OF INTERESTS

The authors declare that they have no competing interests.

Supplementary file 3. Draft search strategy step 1 and 2

1. **Search strategy step 1**

PubMed (9 May 2018)

Search	Query	Items found
#1	"Students, Nursing"[Mesh] OR "Internship, Nonmedical"[Mesh:noexp] OR (nursing[tiab] AND student*[tiab]) OR ((nursing[tiab] OR nurse[tiab] OR nurses[tiab]) AND internship*[tiab])) AND ((("Clinical Competence"[Mesh] OR "Clinical Medicine"[Majr] OR clinical*[ti] OR clinical*[ot] OR practice*[ti] OR practice[ot]) AND ("Learning"[Mesh] OR learning*[tiab])) OR clinical learning*[tiab]	**3,586**

Ebsco/ERIC (9 May 2018)

Search	Query	Items found
S7	S1 AND S6	**408**
S6	S4 OR S5	**70,505**
S5	TI ("clinical learning*") OR AB ("clinical learning*")	**84**
S4	S2 AND S3	**70,505**
S3	DE "Learning" OR DE "Active Learning" OR DE "Adult Learning" OR DE "Associative Learning" OR DE "Aural Learning" OR DE "Cooperative Learning" OR DE "Discovery Learning" OR DE "Discrimination Learning" OR DE "Electronic Learning" OR DE "Experiential Learning" OR DE "Incidental Learning" OR DE "Intentional Learning" OR DE "Interference (Learning)" OR DE "Lifelong Learning" OR DE "Mastery Learning" OR DE "Multisensory Learning" OR DE "Nonverbal Learning" OR DE "Observational Learning" OR DE "Prior Learning" OR DE "Problem Based Learning" OR DE "Rote Learning" OR DE "Second Language Learning" OR DE "Sequential Learning" OR DE "Serial Learning" OR DE "Student Centered Learning" OR DE "Symbolic Learning" OR DE "Transfer of Training" OR DE "Transformative Learning" OR DE "Verbal Learning" OR DE "Visual Learning" OR DE "Workplace Learning" OR DE "Active Learning" OR DE "Adult Learning" OR DE "Associative Learning" OR DE "Paired Associate Learning" OR DE "Aural Learning" OR DE "Cooperative Learning" OR DE "Discovery Learning" OR DE "Discrimination Learning" OR DE "Electronic Learning" OR DE "Experiential Learning" OR DE "Field Experience Programs" OR DE "Internship Programs" OR DE "Job Shadowing" OR DE "Service Learning" OR DE "Incidental Learning" OR DE "Intentional Learning" OR DE "Interference (Learning)" OR DE "Lifelong Learning" OR DE "Mastery Learning" OR DE "Multisensory Learning" OR DE "Nonverbal Learning" OR DE "Perceptual Motor Learning" OR DE "Observational Learning" OR DE "Prior Learning" OR DE "Problem Based Learning" OR DE "Rote Learning" OR DE "Second Language Learning" OR DE "Sequential Learning" OR DE "Serial Learning" OR DE "Student Centered Learning" OR DE "Symbolic Learning" OR DE "Transfer of Training" OR DE "Transformative Learning" OR DE "Verbal Learning" OR DE "Visual Learning" OR DE "Workplace Learning" OR TI (learning*) OR AB (learning*)	**381,995**
S2	DE "Clinical Experience" OR TI (clinical* OR practice*) OR AB (clinical* OR practice*)	**205,148**

S1	DE "Nursing Students" OR TI ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*)) OR AB ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*))	**2,294**

Ebsco/CINAHL (9 May 2018)

Search	Query	Items found
S11	S1 AND S10	**3,209**
S10	S5 OR S9	**14,430**
S9	S3 AND S8	**12,924**
S8	MH "Clinical Competence+" OR TI (clinical* OR practice*)	**234,601**
S7	S1 AND S6	**5,669**
S6	S4 OR S5	**32,948**
S5	MH "Learning Environment, Clinical" OR TI ("clinical learning*") OR AB ("clinical learning*")	**2,388**
S4	S2 AND S3	**31,869**
S3	MH "Learning+" OR MH "Conditioning (Psychology)+" OR MH "Memory+" OR MH "Reinforcement (Psychology)+" OR MH "Problem Solving+" OR TI (learning*) OR AB (learning*)	**103,547**
S2	MH "Clinical Competence+" OR TI (clinical* OR practice*) OR AB (clinical* OR practice*)	**631,184**
S1	MH "Students, Nursing+" OR MH "Students, Nursing, Baccalaureate+" OR MH "Students, Nursing, Graduate+" OR TI ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*)) OR AB ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*))	**35,637**

2. Search strategy and numbers of hits step 2

2.1 search strategy

(***PubMed:*** *(concept*[tiab] OR (conceptpart1*[ti] AND conceptpart2*[ti]) OR (conceptpart1 [ot] AND conceptpart2*[ot])) If integral concept could not be found in the Index, this was composed with an AND relation.*

[Mesh] = Medical Subject Headings, keywords in PubMed
[tiab] = words in title or abstract
[ti] = words in title
[ot] = other terms, in particular author keywords
MH = mapped heading, keyword in CINAHL
DE = descriptor, keyword in ERIC

TI = words in title
AB = words in abstract

Search	PubMed	Ebsco/ERIC	Ebsco/CINAHL
#1	"Students, Nursing"[Mesh] OR "Internship, Nonmedical"[Mesh:noexp] OR ((nursing[tiab] OR nurse[tiab] OR nurses[tiab]) AND student*[tiab]) OR ((nursing[tiab] OR nurse[tiab] OR nurses[tiab]) AND internship*[tiab])	DE "Nursing Students" OR TI ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*)) OR AB ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*))	MH "Students, Nursing+" OR MH "Students, Nursing, Baccalaureate+" OR MH "Students, Nursing, Graduate+" OR TI ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*)) OR AB ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*))
#2	authentic learning*[tiab] OR (authentic*[ti] AND learning*[ti]) OR (authentic*[ot] AND learning*[ot])	TI (authentic* AND learning*) OR AB ("authentic learning*")	TI (authentic* AND learning*) OR AB ("authentic learning*")
#3	clinical learning*[tiab]	TI ("clinical learning*") OR AB ("clinical learning*")	TI (authentic* AND learning*) OR AB ("authentic learning*")
#4	clinical placement learning*[tiab] OR (clinical placement*[ti] AND learning*[ti]) OR (clinical placement*[ot] AND learning*[ot])	TI ("clinical placement"* AND learning*) OR AB ("clinical placement learning*")	TI ("clinical placement"* AND learning*) OR AB ("clinical placement learning*")
#5	(clinically based*[tiab] AND learning*[tiab])	TI ("clinically based" AND learning*) OR AB ("clinically based learning*")	TI ("clinically based" AND learning*) OR AB ("clinically based learning*")
#6	(experiential learning*[tiab] OR (experiential*[ti] AND learning*[ti]) OR (experiential*[ot] AND learning*[ot]))	DE "experiential learning" OR TI (experiential* AND learning*) OR AB ("experiential learning*")	MH "Experiential learning" OR TI (experiential* AND learning*) OR AB ("experiential learning*")
#7	experimental learning*[tiab] OR (experimental*[ti] AND learning*[ti]) OR (experimental*[ot] AND learning*[ot])	TI (experimental* AND learning*) OR AB ("experimental learning*")	TI (experimental* AND learning*) OR AB ("experimental learning*")
#8	hidden curriculum*[tiab] OR (hidden*[ti] AND curriculum*[ti]) OR (hidden*[ot] AND curriculum*[ot])	DE "hidden curriculum" OR TI (hidden* AND curriculum*) OR AB ("hidden curriculum*")	TI (hidden* AND curriculum*) OR AB ("hidden curriculum*")
#9	informal learning*[tiab] OR (informal*[ti] AND learning*[ti]) OR (informal*[ot] AND learning*[ot])	TI (informal* AND learning*) OR AB ("informal learning*")	TI (informal* AND learning*) OR AB ("informal learning*")
#10	learning by doing*[tiab] OR (learning*[ti] AND doing*[ti]) OR (learning*[ot] AND doing*[ot])	TI (learning* AND doing*) OR AB ("learning by doing*")	TI (learning* AND doing*) OR AB ("learning by doing*")

#11	"learning from experience*"[tiab]	TI "learning w1 experience*" OR AB "learning w1 experience*"	TI "learning w1 experience*" OR AB "learning w1 experience*"
#12	"learning through experience*"[tiab]	TI ("learning through experience*") OR AB ("learning through experience*")	TI ("learning through experience*") OR AB ("learning through experience*")
#13	(learning*[tiab] AND clinical placement experience*[tiab])	TI (learning* AND "clinical placement experience") OR AB ("learning from clinical placement experience*")	TI (learning* AND "clinical placement experience") OR AB ("learning from clinical placement experience*")
#14	practice based learning*[tiab] OR (practice based*[ti] AND learning*[ti]) OR (practice based*[ot] AND learning*[ot])	TI ("practice based*" AND learning*) OR AB ("practice based learning*")	TI ("practice based*" AND learning*) OR AB ("practice based learning*")
#15	practice learning*[tiab]	TI ("practice learning*") OR AB ("practice learning*")	TI ("practice learning*") OR AB ("practice learning*")
#16	learning from practice*[tiab]	TI (learning w1 practice*) OR AB (learning w1 practice*)	TI (learning w1 practice*) OR AB (learning w1 practice*)
#17	learning in practice*[tiab]	TI (learning w1 practice*) OR AB (learning w1 practice*)	TI (learning w1 practice*) OR AB (learning w1 practice*)
#18	(learning*[tiab] AND clinical practicum*[tiab])	TI (learning* AND "clinical practicum*") OR AB (learning w2 clinical practicum*)	TI (learning* AND "clinical practicum*") OR AB (learning w2 clinical practicum*)
#19	(learning*[tiab] AND clinical field*[tiab])	TI (learning* AND "clinical field*") OR AB (learning w2 clinical field*)	TI (learning* AND "clinical field*") OR AB (learning w2 clinical field*)
#20	(learning*[tiab] AND clinical context*[tiab])	TI (learning* AND "clinical context*") OR AB (learning w2 clinical context*)	TI (learning* AND "clinical context*") OR AB (learning w2 clinical context*)
#21	(learning*[tiab] AND clinical setting*[tiab])	TI (learning* AND "clinical setting*") OR AB (learning w2 clinical setting*)	TI (learning* AND "clinical setting*") OR AB (learning w2 clinical setting*)
#22	(learning*[tiab] AND clinical nursing environment*[tiab])	TI (learning* AND "clinical nursing environment*") OR AB (learning w2 clinical nursing environment*)	TI (learning* AND "clinical nursing environment*") OR AB (learning w2 clinical nursing environment*)
#23	(learning*[tiab] AND clinical environment*[tiab])	TI (learning* AND "clinical environment*") OR AB (learning w2 clinical environment*)	TI (learning* AND "clinical environment*") OR AB (learning w2 clinical environment*)
#24	learning on the job*[tiab] OR (learning*[ti] AND on the job*[ti]) OR (learning*[ot] AND on the job*[ot])	TI (learning* AND "on the job*") OR AB ("learning on the job*")	TI (learning* AND "on the job*") OR AB ("learning on the job*")
#25	workplace learning*[tiab] OR (workplace*[ti] AND learning*[ti]) OR (workplace*[ot] AND learning*[ot])	DE "workplace learning" OR TI (workplace* AND learning*) OR AB ("workplace learning*")	TI (workplace* AND learning*) OR AB ("workplace learning*")

#26	learning in the workplace*[tiab] OR (learning*[ti] AND workplace*[ti]) OR (learning*[ot] AND workplace*[ot])	TI (learning* AND "in the workplace*") OR AB ("learning in the workplace*")	TI (learning* AND "in the workplace*") OR AB ("learning in the workplace*")
#27	work based learning*[tiab] OR (work based*[ti] AND learning*[ti]) OR (work based*[ot] AND learning*[ot])	TI ("work based*" AND learning*) OR AB ("work based learning*")	TI ("work based*" AND learning*) OR AB ("work based learning*")
#28	work integrated learning*[tiab] OR (work integrated*[ti] AND learning*[ti]) OR (work integrated*[ot] AND learning*[ot])	TI ("work integrated*" AND learning*) OR AB ("work integrated learning*")	TI ("work integrated*" AND learning*) OR AB ("work integrated learning*")
#29	learning process*[tiab]	DE "Learning Processes" OR TI ("learning process*") OR AB ("learning process*")	TI ("learning process*") OR AB ("learning process*")
#30	"learning the practice of nursing"[tiab]	TI ("learning the practice of nursing*") OR AB ("learning the practice of nursing*")	TI ("learning the practice of nursing*") OR AB ("learning the practice of nursing*")
#31	(learning*[tiab] AND clinical nursing*[tiab])	TI (learning* AND "clinical nursing"*) OR AB ("learning clinical nursing*")	TI (learning* AND "clinical nursing"*) OR AB ("learning clinical nursing*")
#32	placement learning*[tiab] OR (placement*[ti] AND learning*[ti]) OR (placement*[ot] AND learning*[ot])	TI (placement* AND learning*) OR AB ("placement learning*")	TI (placement* AND learning*) OR AB ("placement learning*")
#33	"Self-Directed Learning as Topic"[Mesh] OR self directed learning*[tiab] OR (self directed[ti] AND learning*[ti]) OR (self directed[ot] AND learning*[ot])	TI ("self directed*" AND learning*) OR AB ("self directed learning*")	MH "Self directed learning" OR TI ("self directed"* AND learning*) OR AB ("self directed learning*")
#34	self regulated learning*[tiab] OR (self regulated [ti] AND learning*[ti]) OR (self regulated [ot] AND learning*[ot])	TI ("self regulated*" AND learning*) OR AB ("self regulated learning*")	TI ("self regulated*" AND learning*) OR AB ("self regulated learning*")
#35	situated learning*[tiab] OR (situated*[ti] AND learning*[ti]) OR (situated*[ot] AND learning*[ot])	TI (situated* AND learning*) OR AB ("situated learning*")	TI (situated* AND learning*) OR AB ("situated learning*")
#36	socialisation*[tiab]	TI (socialisation*) OR AB ("socialisation*")	TI (socialisation*) OR AB ("socialisation*")
#37	socialization*[tiab]	TI (socialization*) OR AB ("socialization*")	TI (socialization*) OR AB ("socialization*")
#38	student learning*[tiab]	TI ("student learning*") OR AB ("student learning*")	TI ("student learning*") OR AB ("student learning*")
#39	ward based learning*[tiab] OR (ward based*[ti] AND learning*[ti]) OR (ward	TI ("ward based" AND learning*) OR AB ("ward based learning*")	TI ("ward based" AND learning*) OR AB ("ward based learning*")

	based*[ot] AND learning*[ot])		

During the search and selection process, three concepts appeared in the literature that had been discarded before, but were added to the list of concepts to run the second search with after discussion in the research team. The total number of hits was calculated after this search.

Concept	PubMed	Ebsco/ERIC	Ebsco/CINAHL
#40	(peer learning*[tiab]) OR (peer*[ti] AND learning*[ti]) OR (peer*[ot] AND learning*[ot])	TI ("peer*" AND learning*) OR AB ("peer learning*")	TI ("peer*" AND learning*) OR AB ("peer learning*")
#41	Peer assisted*[tiab] OR (peer assisted*[ti] AND learning*[ti]) OR (peer assisted*[ot] AND learning*[ot]))	TI ("peer assisted*" AND learning*) OR AB ("peer assisted based learning*")	TI ("peer assisted*" AND learning*) OR AB ("peer assisted based learning*")
#42	(transformative learning*[tiab] OR (transformative*[ti] AND learning*[ti]) OR (transformative*[ot] AND learning*[ot]))	TI (transformative* AND learning*) OR AB ("transformative learning*")	TI (transformative* AND learning*) OR AB ("transformative learning*")

2.2 Number of hits per concept

	Concepts	Combination of searches with # from queries in the above table	PubMed (23 May 2018)	Ebsco/-ERIC (23 May 2018)	Ebsco/-CINAHL (23 May 2018)
1.	**Authentic learning**	#1 AND #2	32	6	23
2.	**Clinical learning/ clinically based learning/ clinical placement learning**	#1 AND (#3 OR #4 OR 5)	631	16	544
3.	**Experiential learning**	#1 AND #6	294	84	571
4.	**Experimental learning**	#1 AND #7	31	2	26
5.	**Hidden curriculum**	#1 AND # 8	26	1	18
6.	**Informal learning**	#1 AND #9	11	7	7
7.	**Learning by doing**	#1 AND #10	12	3	14
8.	**Learning clinical nursing/ learning the practice of nursing**	#1 AND (#30 OR #31)	205	0	31
9.	**Learning from/through experience/learning from clinical placement experience**	#1 AND (#11 OR #12 OR 13)	48	7	4
10.	**Learning in the clinical field/learning in the clinical context/ Learning in the clinical setting/Learning in the clinical nursing environment/learning in the clinical environment**	#1 AND (#19 OR #20 OR #21 OR #22 OR #23)	785	16	240
11.	**Learning on the job**	#1 AND #24	0	2	2

12.	**Learning process**	#1 AND #29	463	40	474
13.	**Learning in practice/learning form practice/ learning in practice environment/learning in practice setting/learning in a clinical practicum/practice learning/practice based learning**	#1 AND (#14 OR #15 OR #16 OR #17 OR #18)	176	10	205
14.	**Placement learning**	#1 AND #32	102	4	64
15.	**Practice based learning**				
16.	**Self directed learning**	#1 AND #33	1210	20	297
17.	**Self-regulated learning**	#1 AND #34	27	2	32
18.	**Situated learning**	#1 AND #35	25	4	17
19.	**Socialication/socialisation**	#1 AND (#36 OR #37)	380	35	372
20.	**Student learning**	#1 AND #38	543	66	663
21.	**Ward based learning**	#1 AND #39	0	1	2
22.	**Workplace learning/learning in the workplace/work based learning/work integrated learning**	#1 AND (#25 OR #26 OR #27 OR #28)	92	5	67
23.	**Peer learning***	#1 AND #40	106	4	31
24.	**Peer assisted learning***	#1 AND #41	23	0	3
25.	**Transformative learning***	#1 AND #42	60	17	19

** Search 23, 24 and 25 have been conducted on 16 september 2018.*

Supplementary file 4. List of potentially eligible concepts and their reason for inclusion/exclusion in the second search step after discussion.

	Inclusion?	Rationale
Active learning	no	Used exclusively for learning in the classroom setting
Authentic learning	yes	Is used as an equivalent to learning in clinical practice[1]
Blended learning	No	Used exclusively for learning in the classroom setting
case based learning	no	Used exclusively for learning in the classroom setting, simulation learning or online learning
clinical experience/ practice experience	no	Used to describe the overall experience of being in a clinical setting rather than the learning process
clinical learning	yes	Used as an equivalent to learning in clinical practice
clinical learning environment	no	Used to describe learning circumstances rather than the learning process itself
clinical learning model	no	Used to describe learning circumstances rather than the learning process itself
Clinical nursing education	no	Is used to describe the entire system (organization, supervision, contents etc.) within which learning takes place
clinical placement learning	yes	Used as an equivalent to learning in clinical practice
clinical skills learning	no	Used to describe a specific part (ie skills learning) of learning in clinical practice
clinically based learning	yes	Used as an equivalent to learning in clinical practice
Collaborative learning	no	Used to describe a specific way of organizing learning in clinical practice (ie learning in pairs)
concept-based learning	no	Used either for curriculum design of for specific learning activities in clinical practice
cooperative learning	No	Used to describing specific learning/ teaching activities
deep learning	no	Used exclusively for learning in the classroom setting, simulation learning or online learning
Deliberatie practice	No	Used to describing specific learning/ teaching activities
Didactic learning	No	Used exclusively for learning in the classroom setting
dual level learning	No	Used to describe a specific way of organizing classroom learning
empathy learning	no	Used to describe the learning of a specific skill (ie empathy)
Enquiry based learning	no	Used to describing specific learning/ teaching activities
Experiential learning	yes	Is as an equivalent to learning in clinical practice
Experimental learning	yes	Is as an equivalent to learning in clinical practice
Hidden curriculum	yes	Although this is not an equivalent to learning in practice, we decided to include this concept as it is used to

		describe a way in which knowledge and valued are transmitted in clinical practice outside specific teaching or learning activities
Informal learning	yes	Is used as an equivalent to learning in clinical practice
(Work) integrated learning	yes	Is (in some cases)[2] used as an equivalent to learning in practice
Integrative learning	No	Used for describing specific teaching and learning strategies
Intentional learning	no	Used to describe specific learning/ teaching activities[3] or competencies[4]
interprofessional learning	no	Used to describe a specific way of organizing learning in clinical practice (ie learning with and from other disciplines)
Learning by doing	yes	Used as an equivalent to learning in clinical practice
learning clinical nursing	yes	Used as an equivalent to learning in clinical practice
learning from/through experience	yes	Used as an equivalent to learning in clinical practice
learning from clinical placement experience	yes	Used as an equivalent to learning in clinical practice
learning from practice	yes	Used as an equivalent to learning in clinical practice
learning in a clinical environment	yes	Used as an equivalent to learning in clinical practice
learning in practice/ learning in practice environment/ learning in practice setting/learning in a clinical practicum	yes	Used as an equivalent to learning in clinical practice
Learning in the clinical field/learning in the clinical context/ Learning in the clinical setting/Learning in the clinical nursing environment/learning in the clinical environment	yes	Used as an equivalent to learning in clinical practice
learning in the practice setting	yes	Used as an equivalent to learning in clinical practice
Learning on the job	yes	Used as an equivalent to learning in clinical practice
Learning on the workplace/ workplace learning/learning in the workplace	yes	Used as an equivalent to learning in clinical practice
learning process	yes	Used as an equivalent to learning in clinical practice[5]
Learning situation	no	Used to describe learning circumstances rather than the learning process itself
learning the practice of nursing	yes	Used as an equivalent to learning in clinical practice[6]
learning through experience	yes	Used as an equivalent to learning in clinical practice
learning trajectories	no	Used to describe learning in a specific program[7]
Meaningful learning	no	Used exclusively for learning in the classroom setting[8] or simulation learning[9]
Online learning	no	Used for specific learning activities outside the clinical

		setting
Peer based learning/ peer learning/ peer assisted learning	yes[1]	Used to describe a specific central way learning in clinical practice
Perceptual learning	no	Used to describe a specific technique to learn in clinical practice
placement learning	Yes	Used as an equivalent to learning in clinical practice
Practice learning	Yes	Used as an equivalent to learning in clinical practice
Practice-based learning	Yes	Used as an equivalent to learning in clinical practice
problem-based learning/ problem based learning	no	Used exclusively for learning in the classroom setting, simulation learning or online learning
professional development	No	Used to describe the result of learning in the clinical setting, rather than the process
Reflective learning	No	Used to descrive specific teaching and learning strategies
Self-directed learning	yes	Used (at least in some studies, eg [10]) to describe a very important component of learning in the clinical setting, that is, the part that takes place at the learner's initiative).
Self-regulated learning	yes	Used (at least in some studies, eg[11]) to describe a major part of learning in the clinical setting, that is, the part that takes place at the learner's initiative).
Service learning	no	Used for the particular combination of providing (voluntary) community service and learning in practice
Shared learning	No	Used to describe a specific way of organizing learning in clinical practice (ie learning from and with others)
Situated learning	yes	Used as an equivalent to learning in clinical practice, [12]
socialisation/ socialization	yes	Used to describe a major part of learning in clinical practice
student learning	yes	Is, in some cases (eg [13]) used to describe learning in clinical practice)
task-based learning	No	Used to describe a specific way of organizing learning in clinical practice (ie around tasks[14])
team-based learning	No	Used exclusively for learning in the classroom setting
Transformational learning	No	Used to describe the result of learning in the clinical setting, rather than the process[15]
Transformative learning	yes[2]	Used to describe both process and outcomes of learning [16]
Ward based learning	Yes	Used as an equivalent to learning in clinical practice
Work-based learning	Yes	Used as an equivalent to learning in clinical practice
work-integrated learning	Yes	Used as an equivalent to learning in clinical practice

[1] Excluded in first instance as it appeared to be used to study interventions or specific organizational models. On the basis of results in search step 2, the concept was included in second instance.
[2] Excluded in first instance as it appeared to be used to study classroom learning only. On the basis of results in search step 2, the concept was included in second instance.

workplace learning	Yes	Used as an equivalent to learning in clinical practice

Supplementary file 5. Excluded full text articles and main reason for exclusion

1.	Not been able to retrieve full text of this study
2.	Study is about influencing factors, interventions, organizational models, personal characteristics affecting learning instead of the learning process itself
3.	Study is not about learning/ not possible to separate findings about learning from other findings
4.	No original study or review
5.	Study is incomplete (eg no results)
6.	Study is about a research methodology
7.	Another study within the same project is already included, this study offers no additional findings
8.	Study is too specific
9.	Study is not about clinical practice/ not possible to separate findings about clinical practice from other findings
10.	Study is not about nursing students/not about hospital setting

	1	2	3	4	5	6	7	8	9	10
	x									
Abe (1977)	x									
Allan, Smith, and O'Driscoll (2011)		x								
Alves and Cogo (2014)			x							
Andrade Bezerra, Soares Campos, and Da Silveira (2005)	x									
Arlton and Miercort (1980)				x						
Arrigoni et al. (2017)				x						
Baldwin, Mills, Birks, and Budden (2014)		x								
Barry, Ward, and Walter (2017)						x				
Brackenreg (2004)		x								
Burnard (1991)				x						
Burnard (1992)							x			
Charneia (2007)	x									
Coetzee (2004)								x		
Cope, Cuthbertson, and Stoddart (2000)		x								
Corbett (1973)		x								
Cowman (1998)		x								
Crouch (1991)	x									
Cullingford (1991)	x									
de Jesus, Sena, and Andrade (2014)									x	
de Jesus et al. (2014)		x								
Durgante Alves and Petersen Cogo (2015)			x							
Edwards (2013)						x				
Egginton (2002)	x									
Endacott, Scholes, Freeman, and Cooper (2003)		x								
Evans (1987)				x						
Friedman (1981)	x									
Green and Holloway (1997)						x				
Hauge (1999)	x									
Hauge (1999)	x									
Henderson et al. (2018)		x								
Henderson et al. (2018)	x									
Hill (2016)			x							
Hold, Blake, and Ward (2015)									x	
Holmsen (2010)		x								

Ironside, McNelis, and Ebright (2014)			x						
Kosowski (1995)								x	
Kuiper (2004)		x							
Levett-Jones (2007)				x					
Love (1996)		x							
MacFarlane and Hart (1995).				x					
May and Veitch (1998)		x							
Montagna, Benaglio, and Zannini (2010)		x							
More and Conklin (1995)		x							
Newton, Billett, and Ockerby (2009)		x							
Nolan (1998)			x						
O'Shea (2003)								x	
Paliadelis and Wood (2016)		x							
Papp, Markkanen, and Von Bonsdorff (2001)	x								
Polifroni, Packard, Shah, and MacAvoy (1995)			x						
Rajeswaran (2016)		x							
Reutter, Field, Campbell, and Day (1997)			x						
Rodríguez García, Ruiz López, González Sanz, Fernández Trinidad, and De Blas Gómez (2014)			x						
Sandvik et al. (2012)		x							
Shahsavari, Zare, Parsa-Yekta, Griffiths, and Vaismoradi (2018)			x						
Shin (2000)			x						x
Shirazi, Sharif, Molazem, and Alborzi (2017)								x	
Skaalvik, Normann, and Henriksen (2010)		x							
Smith and Morrison (2006).									x
Spouse (2001)			x						
Tagliareni (1991)	x								
Thrysoe, Hounsgaard, Dohn, and Wagner (2010).			x						
Tupala, Tossavainen, and Turunen (2004)									x
Vesanto and Munnukka (1996)	x								
Wilson (1994)			x						
Wong and Lee (2000)									x
Zhao, Kuan, Chung, Chan, and Li (2018).						x			

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BMJ Open

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Journal:	*BMJ Open*
Manuscript ID	bmjopen-2019-029397.R1
Article Type:	Original research
Date Submitted by the Author:	25-Jun-2019
Complete List of Authors:	Stoffels, Malou; Amsterdam UMC, Vrije Universiteit Amsterdam, VUmc School of Medical Sciences, Department of Research in Education; Amsterdam UMC, Vrije Universiteit Amsterdam, Amstel Academie Peerdeman, Saskia; Amsterdam UMC, Vrije Universiteit Amsterdam, VUmc School of Medical Sciences, Department of Research in Education; Amsterdam UMC, Vrije Universiteit Amsterdam, Department of Neurosurgery Daelmans, Hester; Amsterdam UMC, Vrije Universiteit Amsterdam, VUmc School of Medical Sciences, Department of Research in Education; Amsterdam UMC, Vrije Universiteit Amsterdam, VUmc School of Medical Sciences, Department of Skills Training Ket, J.C.F. ; Amsterdam UMC, Vrije Universiteit Amsterdam, VUmc School of Medical Sciences, Medical Library Kusurkar, Rashmi; Amsterdam UMC, Vrije Universiteit Amsterdam, VUmc School of Medical Sciences, Department of Research in Education; Vrije Universiteit Amsterdam, Faculty of Psychology and Education, LEARN! Research institute for learning and education
Primary Subject Heading:	Nursing
Secondary Subject Heading:	Research methods
Keywords:	Nursing, EDUCATION & TRAINING (see Medical Education & Training), MEDICAL EDUCATION & TRAINING, Clinical learning

How do undergraduate nursing students learn in the hospital setting? A scoping review of conceptualisations, operationalisations and learning activities.

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Word count

4030

Key words

Undergraduate nursing education, learning in practice

ABSTRACT

Objectives. Despite its relevance to nursing education, there are gaps in the knowledge about clinical learning and the terminology to describe this. This study aimed to examine how concepts equivalent to "learning in practice" are used and operationalised and which learning activities are reported in the nursing education literature. The final aim was to propose terminology to guide future studies.

Design The scoping framework proposed by Arksey and O'Malley was used. Two systematic searches were conducted in PubMed, EBSCO/ERIC and EBSCO/CINAHL between May and September 2018; first to identify concepts equivalent to 'learning in practice' and second to find studies operationalising these concepts. Eligible articles were studies that examined the regular learning of undergraduate nursing students in the hospital setting. Conceptualisations, theoretical frameworks and operationalisations were mapped descriptively. Results relating to how students learn were synthesised using thematic analysis. Quality assessment was performed using the Critical Appraisal Skills Programme (CASP) checklist.

Results From 9360 abstracts, 17 articles were included. Five studies adopted a general, yet not explained, synonym for learning in practice, the other studies approached the topic focusing on the social, unplanned, or active nature of learning. All studies used a qualitative approach. The small number of studies and medium study quality hampered a thorough comparison of concepts. The synthesis of results revealed five types of learning activities, in which autonomy, interactions, and cognitive processing were central themes. These themes were acknowledged by an expert panel.

Conclusions The current body of literature offers little guidance on the use of specific concepts to study clinical learning. Studies agree on the key elements of clinical learning. In future research, formal and informal components of learning should be addressed, and clarity about desirable outcomes of clinical learning should be provided. Also, the interplay between behaviour and cognitive processing should be further investigated.

ARTICLE SUMMARY

Strengths and limitations of this study

- This study followed a rigorous design, using an established research framework, a comprehensive two-step search strategy and a well-documented selection process.
- The analysis of both conceptualisations, study quality and study results allowed for the identification of quantitative and qualitative gaps in the literature.
- A limitation is that the literature search only covered undergraduate nursing education in the hospital setting, while a comparison with literature on learning in practice in other health professions would enrichen our understanding of potential conceptualizations.

INTRODUCTION

Learning in the clinical setting is crucial for becoming a competent nurse[1]. However, although a vast body of knowledge exists on factors that influence learning, the process itself remains underexposed in the literature[2]. Understanding learning in the clinical setting can help design, supervise and evaluate individual learning trajectories. In the nursing education literature, just as in other health professions education literature, different terms are used to describe and study learning in clinical practice, with different underlying theoretical or conceptual frameworks.

This study aimed to examine how different concepts equivalent to "learning in practice" are used and operationalised and which learning activities are reported in the nursing education literature. The final aim was to propose a terminology to guide future studies. To our knowledge, the only study that included distinct concepts of clinical learning in the health setting in a review before, was a concept analysis of work-based learning in health care education from 2009[3]. The authors identified common attributes, enabling factors and consequences of workplace learning and proposed a definition. The current review built on this work by critically examining the use of these concepts within the context of undergraduate nursing education and analysing their outcomes.

To enable comparison between studies, we focused on undergraduate students in the general hospital setting. This context is the traditional setting for nursing training and comprises a variety of factors that may be relevant for learning, such as the presence of peers and different healthcare professionals, as well as complex and acute patients, thereby offering a wide array of multidimensional learning opportunities[4]. Moreover, we limited our study to undergraduate (also called bachelor, diploma or associate degree) education, which is the initial training that prepares for registration as a nurse, in which students learn the profession and shape their identity. As a final demarcation allowing for the comparison between concepts, we focused on studies about how students learn during their regular day to day work at the ward, instead of evaluations of specific interventions or models.

METHODS AND ANALYSIS

The scoping review approach was chosen, as it can help understand complex concepts through clarifying definitions and conceptual boundaries[5] and enables to identify key concepts and gaps in the literature[6]. The approach developed by Arksey and O'Malley [7] and refined by Levac, et al. [8] and the Joanna Briggs institute [9] was used, consisting of the six stages (1) identifying the research question; (2) identifying relevant studies; (3) selecting studies; (4) charting the data; (5) collating, summarizing and reporting the results; (6) expert consultation. Reporting on this scoping review followed the PRISMA Extension for Scoping Review checklist[10], as outlined in supplementary file 1.

The review followed an a priori developed research protocol [11] (see supplementary file 2) with a little deviation by choosing the CASP checklist over the quality indicators of Buckley et al. [12] for quality assessment, as this allowed for more specific and systematic quality assessment. As anticipated, study questions and refined inclusion criteria were added during the search process.

Stage 1. Identifying the research question

The original research question was:

- How are different concepts that are used as an equivalent to learning in the hospital setting operationalised in the undergraduate nursing education literature?

As scoping is an iterative process, the following research question was added based on the findings along the search process:

Which activities do undergraduate nursing students learn from the clinical setting?" Stage 2. Identify relevant studies

As suggested by the Joanna Briggs institute[9], a comprehensive search strategy was iteratively developed (by MS and JCFK) following the Peer Review of Electronic Search Strategies (PRESS) 2015 guideline statement[13], starting with a broad search (search step 1) to inform the subsequent search strategy (search step 2). The different search queries were first developed for PubMed and later extended to EBSCO/ERIC and EBSCO/CINAHL. See our search strategy for both steps in supplementary file 3.

In search step 1, from inception to May 2018 the terms 'learning in clinical practice' and 'undergraduate nursing students' were combined to identify concepts that are used as an equivalent to 'learning in clinical practice' and could be included in the second search step. Eligible concepts were those relating to the process of clinical learning rather than specific aspects of it or associated factors. The first 200 abstracts were scanned by the two reviewers (MS and RAK) independently to extract potentially eligible concepts. As the same concepts had been selected by the two researchers, the first reviewer screened the rest of the abstracts. After all abstracts had been screened, all concepts were discussed between the two reviewers and a final selection of concepts to be included in the second search step was made. Disagreements were resolved through comparison of the concept with the inclusion criteria, informed by the abstracts. Potentially eligible concepts of which the meaning remained unclear after discussion, were also added to the list of concepts to be used in search step 2. Other concepts coming up during the search and selection process that appeared eligible, were added to the selection of concepts after discussion between the reviewers. See supplementary file 4 for concepts and reason for inclusion/exclusion in the second search step.

In search step 2, between May and September 2018 each of the identified concepts was combined with 'undergraduate nursing students' to find studies operationalizing these concepts in the literature about nursing students' learning in practice. After these two searches, reference lists were checked for additional publications.

Stage 3. Study selection

Two researchers (MS and RAK) independently screened abstracts from search step 2 and assessed the eligibility for full text retrieval. Selected full-text studies were compared between the reviewers with disagreements being resolved through discussion and consensus and with input from the full research team.

The inclusion criteria were developed iteratively. The initial inclusion criteria were:

- Original research or reviews in peer reviewed journals that have learning in undergraduate clinical nursing practice in the hospital setting as one of their main topics, regardless of publication date and type of article.
- Studies that examine how students learn in the clinical hospital setting

In line with the aim of the study, the inclusion criteria were refined to:

- Original research or reviews in peer reviewed journals, regardless of publication date type of article and study quality, that examine the learning of undergraduate nursing students in the clinical hospital setting as it regularly occurs

Resulting in the following exclusion criteria:

Studies:

- evaluating organizational models or interventions
- about factors influencing learning in clinical practice, including supervision styles, teaching methods and clinical learning environment
- outside the general hospital setting
- about very specific student populations, patient populations or settings (e.g. palliative care) generating results that might be limited to that setting
- about interprofessional learning
- about the acquisition of specific skills
- about student's 'experience' of clinical learning *without explicit reference to the learning process.*

As the study aimed to examine how learning in practice is operationalised in peer-reviewed research, books, book reviews, commentaries, letters to the editor, PhD theses, and reports were excluded.

Stage 4. Charting the data

Selected studies were documented including study characteristics (year, country, methodology, study question, study design, participants, outcomes, study quality), conceptualisation of learning in practice (definitions, theoretical underpinnings/rationale, operationalisations), results, learning activities, and study quality. Learning activities were extracted by two reviewers independently (MS and RAK), the other variables were initially charted by the first reviewer and checked by the second reviewer. The extraction form was calibrated during the first five studies and agreed upon after discussion between the first two reviewers. The completed form was discussed in the research team for accuracy and validity. Study findings that did not relate nursing students' learning in the clinical setting were marked. Although formal assessment of study quality is generally not performed in scoping reviews[9], this is subject to debate[6]. Quality assessment of included studies by the Critical Appraisal Skills Programme (CASP)[14] was decided upon to address qualitative gaps in the literature[8].

Stage 5. Collating, summarizing and reporting results

Data were analysed in two ways. First, descriptive account of concepts, theories, subsequent operationalisations and study quality were given and compared. Second, a data driven thematic analysis of the outcomes of the studies that are relevant for our research questions was conducted (Dixon-Woods, Agarwal, Jones, Young, & Sutton, 2005). To select those outcomes, first learning activities were separated from other study results by going through the result sections of the studies and underlining findings (themes, observations, quotes) that referred to how nursing students learn in the hospital setting. When possible, the original wordings were used in this analysis. Expressions that could not be understood outside the context of the article, were slightly rephrased. These findings were categorised using open coding, resulting in six classes of activities. All the results were compared and consolidated through consensus between MS and RAK.

Stage 6. Expert consultation

In order to confirm our findings, we presented our analysis of the learning activities to four experts of different institutions in the Netherlands (one senior clinical educator, one coordinator of clinical education, one head of nursing education department, and coordinator of nursing education)Short semi-structured (telephone) interviews were conducted, in which a written summary of the findings was presented and respondents were asked a) whether they recognized the findings, b) whether they missed anything, c) whether they had any other comments on the findings.

Patient and public involvement

As education is essential for improving patient care, patients will eventually benefit from the body of knowledge this study contributes to. However, specific interests of patients have not been investigated. Patients have not been involved in the design or the conduct of the study. The consulted experts can be considered participants of this study, and will be informed about the results as soon as it has been published.

RESULTS

Search results

This initial search to identify concepts yielded 7211 abstracts, of which 5658 remained after removing duplicates. As the two reviewers (MS and RAK) reached full agreement on potentially eligible concepts after screening the first 200 abstracts, the remaining abstracts were screened by MS only. Seventy potentially eligible concepts were extracted. After discussion between the reviewers, 22 concepts were selected, to which three concepts were added later in the process, so the second search was run with 25 different concepts. See supplementary file 4 for concepts and reason for inclusion/exclusion in search step 2. The second search, using the 25 concepts selected in the initial search, generated 9360 results of which 5880 remained after duplicates were removed. For both abstracts and full texts, RAK and MS independently applied inclusion criteria and subsequently discussed their findings, resulting in the selection of 83 abstracts for full text reading and the inclusion of 17 studies (see supplementary file 5 for excluded full texts and reason for exclusion). Three pairs of studies were based on (partly) overlapping data[15-20], but were all included as the results only partly overlapped. Reference list screening of the full text articles did not generate any extra results. See Figure 1 For a flow diagram of search step 2.

General study characteristics

All included studies examined the process of undergraduate nursing students' learning in the clinical setting, as a result of their primary aim or as a significant secondary finding of a broader research question. Six of the studies[17-22] investigated undergraduate nursing students' learning in both the classroom setting and the clinical setting. One of the studies included not only nursing students, but also midwifery and social work students[23]. However, we restricted our data presentation to findings concerning nursing students in the clinical setting. All were primary studies, of which sixteen were

qualitative studies, and one mixed methods[20]. Publication year ranged from 1987-2018. Studies were conducted in different countries in Europe, Middle East, North America and Oceania.

Study quality

Table 1 shows the quality of the included studies as assessed with the Critical Appraisal Skills Programme (CASP)[14] tool. In the only mixed method study included[20], the quantitative data was analysed only descriptively and was used to inform the qualitative data. Therefore, this study was also appraised with the CASP.. To summarise, in the majority of studies it was unclear how the results answered the research question, because of a lack of clear aims, lack of clear operationalization, or both, in spite of clear descriptions of the process of data analysis and its outcomes.

	Baraz, et al. [24]	Burnard [19]	Burnard [20]	Carey, et al. [25]	Dadgaran, et al. [26]	Gidman [23]	Grealish and Ranse [27]	Greenand Holloway [21]	Kear [17]	Kear [18]	Manninen [15]	Manninen, et al. [16]	Mayson and Hayward [28]	Roberts [29]	Seylani, et al. [22]	Stockhausen [30]	Windsor [31]
Was there a clear statement of the aims of the research?	yes	No	yes	yes	no	yes	yes	No	no	no	no	yes	yes	yes	no	yes	yes
Is a qualitative methodology appropriate?	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Was the research design appropriate to address the aims of the research?	yes	can't tell	yes	yes	no	yes	Can't tell	Can't tell	yes	Can't tell	yes	yes	yes	yes	no	yes	yes
Was the recruitment strategy appropriate to the aims of the research?	yes	can't tell	yes	yes	can't tell	yes	can't tell	can't tell	yes	can't tell	can't tell	can't tell	can't tell	can't tell	yes	no	no
Was the data collected in a way that addressed the research issue?	yes	can't tell	can't tell	yes	yes	can't tell	yes	Can't tell	Can't tell	yes	Can't tell	yes	yes	yes	Can't tell	yes	yes
Has the relationship between researcher and participants been adequately considered?	no	can't tell	can't tell	yes	no	yes	yes	No	no	no	no	can't tell	yes	can't tell	no	no	no
Have ethical issues been taken into consideration?	yes	can't tell	Can't tell	yes	yes	yes	can't tell	no	yes	can't tell	can't tell	yes	yes	yes	yes	yes	no
Was the data analysis sufficiently rigorous?	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	can't tell	yes	yes	can't tell	yes	yes	yes
Is there a clear statement of findings?	yes	Yes	No	yes	no	yes	yes	no	yes	yes	no	yes	yes	yes	yes	yes	yes

Table 1. quality of the included studies as assessed with the Critical Appraisal Skills Programme (CASP)[14] tool

Concepts, operationalisations and learning activities

Table 2 summarises the main concepts, operationalisations, frameworks, findings and learning activities of the 17 selected studies. Findings concerning conceptualisation and operationalisation as well as the results concerning learning activities will be discussed in the following paragraphs.

	Conceptualisation			**Operationalisation**	**Learning activities**	
	Main term(s) used to describe learning in practice *definition, if provided, in italics*	**Main concept studied** *Definition, if provided, in italics*	**Theoretical or conceptual framework for interpreting results/explicit reference to learning theories**	**Summary of operationalisation**	**Main study results, arranged according to the studies' objectives**	**Learning activities for nursing students in the hospital setting, identified by the reviewers in the studies' result sections**
Baraz, Memarian, and Vanaki (2014)	Learning process in clinical setting	Learning styles in clinical setting *Individual's preferred methods of knowledge and skill acquisition and information organization.*	No theoretical framework, used, reference to Kolb's stages of experiential learning	Semi-structured interviews about what and how students learn in the clinical setting.	Three clinical learning styles 1. Thoughtful observation 2. Learning by doing 3. Learning by thinking	- careful observation of role models performance - reflective observation during clinical rounds - Participating in medical rounds - clinical rounds - nursing rounds by instructors and classmates - active involvement in procedures - caring for sensitive patients - Active collaboration with peers - maintaining continuity by making active patient contact and repeating nursing procedures - assuming responsibility for patient care - memorizing info by history taking - accountability for clinical homework - inquiring staff and peers - critical thinking

						- monitoring, critiquing, avoiding unsafe practice
Burnard (1992b)	Clinical experiences	Experiential learning *'experiential learning' has been used to describe many different sorts of educational approaches ranging from the use of interactive group strategies) to accrediting people for their life experience when considering those people for entrance to courses*	No theoretical framework, used, reference to Kolb's stages of experiential learning	In depth interviews about how students perceive experiential learning	Definitions of experiential learning: a. something more than just being taught b. something that you use when you use your own experience c learning in the clinical setting	- just doing - just being there - learning by seeing - selecting one of the nurses as a role model - being personally involved and immersed in the learning situation
Burnard (1992a)	Clinical experiences	Experiential learning No definition provided with justification: *'it appears that the term can be used by different people in different ways'*	No theoretical framework, used, reference to Kolb's stages of experiential learning	Interviews about how students and tutors experience experiential learning and questionnaire about perceptions of experiential learning	Experiential learning 1. is learning by doing 2. is personal learning 3. involves reflection Students mostly relate experiential learning to learning in the clinical setting.	- learning by taking part - not only doing but also reflecting. - observing role models
Carey, Chick, Kent, and Latour (2018)	Learning in clinical settings/ learning within the clinical practice environment; Clinical learning	Peer assisted learning *in which students acquire skills and knowledge through the active help provided by status equals or matched*	-	Observation of interaction patterns between students	Three themes contributing to impact of peer assisted learning: - peers as facilitators to develop learning - working together as peers to develop clinical practice and deliver care - positive support and interaction from peers to enhance networking	- watching demonstrations by other students - asking questions - seeking advice and guidance - discussing development plans - discussing practice standards - challenging each other's knowledge - Sharing roles

		companions (Topping, 2005).			and develop working structure.	- sharing experiences of clinical practice - discussing challenges of finding one's way in the clinical environment
Dadgaran, Parvizy, and Peyrovi (2012)	Clinical learning	Clinical learning	-	semi-structured interviews about how students experience their clinical learning; subsequent observations of students in the clinical setting with a focus on interactions	Five categories and one 'core variable': 1. facing unfavourable clinical facts 2 analysis of a clinical situation and appropriate decision making 3. bridging the gap between practice and theory 4. struggle for clinical independence 5. Dynamism 6. struggle to acquire clinical competence Two approaches to learning: 1. Microlearning 2. Macrolearning	- trying to figure out what regulations are and what they should be through detection of the environment - modify learning deficits to fight the feeling of being unable to answer questions - try to analyse the situation and make an appropriate decision - increase theoretical knowledge through reading books and asking questions - in the ward, review already learned materials (reconstructive thinking) - analysis of clinical issues (clinical reasoning) - making links between theory and practice - design care plans - organizing care on the basis of self-made care plans - doing tasks independently
Gidman (2013)	Learning in practice,	Learning from patient stories	No theoretical framework, used, reference to Eraut's theory on informal learning	Conversational interviews about students' perceptions of their learning experiences of listening to patient stories.	1. Students value listening to stories for learning 2. students develop relationships with patients 3. students learn from the subjective and emotional perspective of patients 4. students think back to their own personal stories when caring for	- listening to patients' personal stories - building relationships with patient - listening to relatives of a patient - reflecting on personal experiences

					patients 5. listening to stories has a positive impact on understanding patients and a commitment to patient care.	
Grealish and Ranse (2009)	learning in the workplace, clinical learning	Learning in the clinical workplace	Community of practice	Students' written narratives about where they learned while on clinical placement.	Three thematic constructs, called 'learning triggers': a. participation (or observation) of a task or procedure that leads to (takes them into) a complex, dramatic reading of nursing work b. being personally (emotionally) confronted by the work (high challenge) c. meeting nurses who contribute to the development of an image of what the students wants to be as a nurse	- being involved in the practical aspects of caring for a patient - shifting focus from the task to the person - talking to patients' relatives - looking at the patient as a person, taking an interest in their needs - engaging in post-operative observations - assisting patients in little things - giving medications - Being personally (emotionally) confronted by the work - experiencing positive and negative emotions - taking responsibility - talking to patients - meeting nurses who contribute to the development as an image - identifying a resident nurse as a role model - receiving feedback from resident nurses - aligning personal practice with what is observed - working independently in a supportive surrounding - witnessing poor practice
Green and Holloway (1996)	Learning in the clinical setting	experiential learning	No theoretical framework, used,	Non-directive interviews about students'	6 themes: a. Students were able to define experiential learning, usually	- working with the client (including the intuitive element) - participating, interacting, shared

			reference to Kolb's stages of experiential learning	understanding, experience and interpretation of experiential learning.	encapsulating both classroom and clinical experience. The importance of the experience itself appeared fundamental. b. Role play is identified as the main example of experiential teaching and learning. c. Students were aware of the issues arising from the problematic relationship between theory and practice. d. The importance of reflection as a stage in experiential learning and of reflective practice was highlighted indicating diversity in application. e. Concerns regarding clinical practice. f. The importance of clinical supervision viewing it as experiential learning.	learning with peers. - evaluating nursing models - reflecting. - sharing experiences. - selecting from previous experience to contribute to new ones - practicing of skills - practicing with people. - patient care - non-threatening supportive collaboration with a colleague - learning form practice and reflection - involving clients - reflecting in the form of a portfolio - maintaining personal journals
Kear (2009)	Clinical experience	transformative learning *The process of critically reflecting upon previous assumptions or understandings in order to determine whether one still holds them to be true or challenges their claims (Mezirow).*	Transformative learning	Students' stories about how they experienced their learning	Upon analysis of the narrative data, five threads emerged from the interviews with the participants. 1) Stories of the multi-faceted process of learning 2) Stories of experiential learning 3) Stories of human interactions as central to defining nursing and caring 4) Stories that intertwine personal life experiences and nursing 5) Stories of transformative learning	- creating a connection between clinical experience and classroom material - utilizing peers - learning how to do things - meeting patients with their own stories - looking things up in one's books - providing end-of-life care - caring for a paediatric cancer patient and seeing graduate nurses let her do it in her own way - learning to understand the needs of patients that are unable to communicate - observing other nurses to

						determine what kind of nurse they want to be (both negatively and positively) - just spending time with patients - observing patient situations that were unjust or nursing care that was viewed as sub-optimal
Kear (2013)	Clinical experiences	transformative learning *Changes in meaning perspectives that have developed over an individual's lifetime based upon their life experiences (Mezirow, 2000).*	Transformative learning	Students' stories about how they experienced their learning	Upon analysis of the narrative data, five threads emerged from the interviews with the participants. 1) Stories of the multi-faceted process of learning 2) Stories of experiential learning 3) Stories of human interactions as central to defining nursing and caring 4) Stories that intertwine personal life experiences and nursing 5) Stories of transformative learning	- creating a connection between clinical experiences and classroom material - Interacting with others in the clinical environment - understanding patients' needs by interacting with them - observing nurses to determine what kind of nurse they want to be - providing end-of-life care
Manninen et al. (2013)	learning process in clinical practice; learning through participation and dialogue; learning in clinical practice; learning at a clinical education ward	Experiences of learning at a clinical ward	Authenticity and transformative learning	semi-structured interviews of how students experienced their encounters with others.	Two main themes: a. mutual relationship b. belongingness	- creating a relationship with patients by meeting them independently - listening and communicating with the patient/ adjust communication to the individual patient's capacity and needs - involving the patient in the nursing process by identifying the patient's own resources - Learning from making failures - handling difficult situations and feelings - collaborating with physicians, physiotherapists, other

						professionals and other students - working together with other students, discussing patient care, sharing experiences giving support, informing and showing
Manninen (2016)	Learning in clinical practice	Nursing students' learning in relation to encounters with patients, supervisors, peer students and other healthcare professionals.	transformative learning and concepts of authenticity and threshold	Semi-structured interviews and group interviews of students' experience of their learning with a focus on their encounters with others. Observations with follow up interviews about student-patient encounters and about supervision.	The results show that the core of student meaningful learning is the experience of both external and internal authenticity. External authenticity refers to being in a real clinical setting meeting real patients. Internal authenticity is about the feeling of belonging and really contributing to patients' health and well-being.	- creating mutual relationships - taking care of patients with extensive needs for nursing interventions.
Mayson and Hayward (1997)	Clinical practice experiences	Learning from hidden curriculum *Hidden curriculum involves the experience and application of theory and the wider social context relates to the practice development.*	hidden curriculum	semi-structured interviews about clinical areas and persons that have been beneficial for students' learning, as well as descriptions of their learning.	*Given a lack of a summary of important themes, I extracted these findings myself* 1. caring relationship is central for nursing; relationships with patients are significant experiences 2. Registered nurses and tutors are contributors to students' learning if they include students 3. students actively seek positive experiences 4. Peers play a significant role in learning 5. importance of being part of the ward team, facilitated by the ward	- Working in the medical/surgical areas. - Talking with/ listening to clients - helping/ making a difference for the patient - looking at positive role models - sitting together with peers/talking to peers about experiences. - watching supervisors on nursing skills and communication skills

					nurse 6. theory-practice gap	
Roberts (2008)	Clinical learning; informal on-the job learning	Peer learning *Peer learning involves students learning from each other*	No theoretical framework, used, reference to Eraut's theory on informal learning and Melia's theory of professional socialization	observation of students in clinical practice with a focus on peer interactions	Themes: a. value placed on friendships and learning in clinical practice. B. students learning survival skills (implicit and explicit rules) c. developing clinical skills	- working alongside other students. - passing along implicit rules - making mistakes/ being pulled up/called about them - sharing clinical skills - asking other students for help. - teaching other students, regardless of year of study.
Seylani et al. (2012)	Clinical experiences	Informal learning *Informal or indirect learning can occur as a function of observing, retaining, and replicating behaviours during educational experiences*	-	semi-structured interviews about what changes students experienced during their study apart from theoretical and practical knowledge.	Five categories of students' experiences: a. personal maturity and emotional growth, b. social development c. closeness to God d. alterations in value systems e. ethical and professional commitments	- Frequent personal interactions - developing relationships - frequent exposure to life and death situations - interacting with others. - caring for people with different religious beliefs - learning from patients struggling with chronic illness - continuously engaging with people who need help - seeing patients suffer - communicating with patients - caring for the most vulnerable - confronting the light and dark sides of life
Stockhausen (2005)	learning in the workplace	learning in the workplace	No theoretical framework, used, reference to Kolb's stages of experiential learning	Students' journals and reflective group debriefings comprehending reflections on clinical experiences.	Themes a. Entering the world of the patient b. Clinicians making a difference c. Constructing an identity as a nurse	- learn through the patient's experience - reacting to and deciphering emotive non-verbal cues from the patient as they care for them. - interacting with the patient - reflectively interpreting experiences with the patient.

						- sharing and developing everyday nursing practices with the RN - constructing their own schemata of admirable qualities the RN displays - picking up little tips from the RN/ little things that she does. - listening to RNs - confirming their nursing practices and assimilating theoretical and clinical knowledge - practicing skills - doing what it is it that nurses do - activities such as making a bed or showering a patient when considered from a student's achievement perspective. - Engaging with the activities of nursing - Making comparisons and discriminations of practices
Windsor (1987)	Learning in the contextual setting of clinical practice	clinical learning experience		Focused interviews about how nursing students perceive their clinical experiences.	Main categories of learning: nursing skills, time management, professional socialization. A pattern of student development through three phases	- practicing nursing skills - going back to books and journals - poring over chart for hours - consulting other health care providers - writing papers - observing nurses and participating in nursing functions - preparing for clinical practice including meeting patients, reading charts, studying patients' health needs, consulting staff. - Caring for lots of different patients with different diseases, different kinds of wards, variety of instructors, working with different equipment.

						- Working more subsequent shifts with the same patient - asking question without feeling embarrassed - asking questions to their peers

Table 2. Main concepts, operationalisations, frameworks, findings, learning activities of the included studies

Conceptualisations

Main concepts

To analyse how learning in practice was approached we compared the main concepts of study, usually reflected in the aims of the paper. Five of the papers studied a concept that was a synonym for learning in clinical practice such as clinical learning experience or workplace learning [16 26 27 30 31]. However, in none of these studies the concept was defined or justified. The remaining eleven studies examined a specific concept related to learning in general, which was studied within the context of clinical practice. In four of the studies this concept concerned social learning, either in general, or from specific groups that are naturally present in the nursing ward [15 23 25 29]. In five of the studies, the non-conscious, unplanned nature of learning was explicitly targeted by the concepts of experiential, informal, and hidden curriculum learning[19-22 28]. The remaining studies focused on the active role of the student in learning by investigating learning styles[24], or a specific combination of both the process and effects of learning as reflected in the concept of transformative learning[17 18].

Theoretical frameworks

The five studies that used a theoretical or conceptual framework to structure the study, used Wenger's community of practice[27] or Mezirow's transformative learning[15-18]. Three of the studies tried to extend on existing theories using a grounded theory approach[19 20 26]. The remaining nine studies discussed their research questions and findings in the light of previous literature relevant for their specific study[21 22 30 31], some of them referring to theories about learning such as Eraut's theory of informal learning, Melia's theory of professional socialization[29], or Kolb's learning cycle[19-21 24 30]

Operationalisations

Nine studies used interviews, narratives or both to address students experiences of learning in general[17 18 24 26-28] or specifically learning from interactions[15 16 23]. The different approaches shared a semi-structured nature, in which a few main topics were introduced by the researcher, to which students could bring up their ideas and experiences. Some authors[19-21] combined an exploration of what students understood by experiential learning, with an examination of their actual experiences in experiential learning. Finally, in three of the studies, learning was operationalised by the observation of interactions between nursing students and peers or colleagues that play a role in learning[15 25 29].

Comparison of conceptualisations and operationalisations

Most of the studies, apart from the ones that focus on social interactions, adopted a very open approach to examine learning in practice, irrespective of the concepts and theoretical frameworks

used. This resulted in a variety of overlapping outcomes. Together with the small number of studies, a thorough comparison of the suitability of different concepts was difficult.

Learning activities

The thematic analysis allowed us to extract the following classes of activities that are observed or reported to contribute to learning during the daily presence of students in the nursing ward.

a. Working as a nurse
b. Interacting with ward staff
c. Interacting with peers
d. Interacting with patients
e. Processing Information

a. Working as a nurse

Students learn by actively engaging in nursing practice, including gaining responsibility for designing care plans[26], organizing care, practicing skills and delivering patient care themselves[17 19-21 24 26 27 30], within a supportive environment[27]. Several studies explicitly report how the importance of working independently evolves throughout training [15 16 26 31]. It should be noted that this theme may overlap with the other themes, and might reflect a more general characteristic of learning in practice.

b. Interacting with ward staff

Students learn by observing both good and poor examples of registered nurses, listening to them and choosing which one could serve role model[17-20 22 24 27 28 30 31]. Students learn from other professionals on the ward, for example by listening to their discussions during rounds[16 24 31] or receiving feedback [27]. Beside observing nurses, students learn from sharing their work experiences with resident nurses and questioning them[24 26 30 31].

c. Interacting with peers

Students learn from peers by working together, questioning each other, sharing experiences, observing each other at work[17 21 24 25 28], and teaching each other[29]. They pass on implicit rules by asking advice and guidance. Through discussing standards in practice, development plans and practical issues they challenge each other and expand their knowledge[25]. Through dividing the work between them, students optimise their exposure to different learning situations[25].

d. Interacting with patients

Listening to patients and building relationships is reported as an activity that students learn from[15-17 21 23 27 28]. More specifically, caring for patients who have different religious beliefs, communication problems, extensive needs, or chronic illnesses or visibly suffer contribute to students' learning[15-17 22 24 30] as well as providing end-of-life care[17 18 22]. As concrete activities, involving the patient in the nursing process was regarded to be valuable[16] as well as assisting them with little things[27], giving medication, doing post-operative observations, or performing simple tasks such as making a bed, as long as they can be done independently[27].

e. processing information

A final class of activities refers to how students look up, process, and store information related to patient care and their learning process. Reflecting on nursing practice promotes learning[19-21 24 30], sometimes supported by a journal or a portfolio[21]. More specifically, students reflect by analysing and comparing nursing practice and thinking how to improve it, making connections with theory and previous experience[17 18 24 26 30]. Negative experiences such as not being able to answer questions, witnessing poor practice, making mistakes, and emotion evoking encounters, stimulate students to reflect and expand their knowledge and skills[16 17 22 27 29]. Students benefit from going through textbooks[17 26 31] and patient charts[24 31], as a preparation for the shift for activities such as patient education.

Summary of results

Figure 2 summarises the findings regarding conceptualisations, operationalisations and learning activities.

Expert consultation

All four experts acknowledged the synthesised learning activities as the core of clinical training. One of them added a nuance that some activities automatically promote learning ('learning by doing'), while others require support by staff (e.g. 'peer learning'). Moreover, one of them noted that experiences may only result in learning after the learning has been made conscious. Compared to their ideal vision of practice learning, another expert missed the active role of the student in creating learning opportunities, as well as formalised elements of learning, such as the formulation of learning goals and the elaboration of theory learned in school. However, this was something they missed in their own daily practice as well. Finally, two experts noted that the 'supervisor' role of the resident nurse was referred to minimally; it appeared that resident nurses were primarily observed as role models. Two of the experts were surprised by the notion that negative experiences are repeatedly mentioned as learning opportunities.

DISCUSSION

The study aimed to examine how different concepts equivalent to "learning in practice" are used and operationalised and which learning activities are reported in the nursing education literature. The final aim was to propose a terminology to guide future studies. . Five of the 17 reviewed studies adopted a general, yet unexplained, synonym for learning in practice as their object of study, the others approached learning in practice focusing on the social, unplanned, and active nature of learning. These foci are in line with the broader literature on practice learning in healthcare education[3 32]. Regardless of conceptualisations, all studies adopted a qualitative approach, resulting in various, yet overlapping themes. A closer examination of learning activities that were reported throughout the results, revealed six classes of activities.

Our eventual aim was to make suggestions about the use of terminology in future research. The small number and poor to medium quality of the studies hindered a thorough comparison between concepts. There were often missing links in the alignment between concepts, study aims, operationalisations and conclusions, resulting in a variety of results that were often difficult to relate to their original study question. Moreover, the sparse use of theoretical frameworks hindered an aggregation of findings[33]. As different learning theories will remain to exist, the use of different concepts might be inevitable [32]. However, we recommend that future studies in this field explain and justify the concepts they use based on previous literature, and critically evaluate findings in the light of the premises of these concepts. In addition to justifying these choices, the literature could benefit if authors compare the assumptions of the concepts they use to frameworks that aggregate characteristics of workplace learning based on previous literature in diverse fields[34]. Alternatively, a further exploration of the meaning of a concept itself can advance the field. However, we suggest that the exploration of the meaning of a concept and participants' experiences with the same concept are clearly separated within studies, as in studies where the two were mixed, it was not always clear whether participants' experiences related to the same phenomenon. [19-21].

Not surprisingly, the informal or hidden nature of clinical learning was frequently referred to. As this learning occurs partly unconsciously, it is a challenging subject to define and to study[35]. In the reviewed studies, informal learning was addressed by what it is *not* (i.e. theoretical and practical knowledge)[22], and hidden curriculum was described by learning resources that were *not* reported by participants[36]. Formal or formalised activities in the clinical area (such as peer teaching and doing 'clinical homework'), were not labelled as such. As both formal and informal learning coexist in the practice setting[37] and the dichotomy between the two has been questioned[38], clear definitions of

these concepts are required, with which the different activities that student engage in throughout the day can be classified.

In most of the studies, potential or desirable learning outcomes were not articulated, and were not separated from outcomes such as professional identity formation or wellbeing. Studies that did include the intended effect of learning in their definitions, as those of Kear [17 18], did not critically revisit if these outcomes were indeed reported. Investigation of the relationship between learning and subsequent outcomes can be found in literature addressing particular outcomes (such as skills learning)[39] or about assessment[40]. These fell outside the scope of our review. Moreover, the lack of predefined outcomes might be a characteristic of clinical learning[41]. However, also in literature addressing complex learning processes such a clinical learning, a critical discussion of actual and desirable outcomes with reference to the body of literature on this topic, is warranted.

The analysis of learning activities is congruent with literature on the importance of increasing independence[42], interaction with others[43], learning from authentic situations with patients[44], and reflection[45] as well as with experiences from our expert panel. In the reviewed studies, the interactions between concrete behaviours and cognitive processing were not systematically addressed, which resulted in separate categories in our analysis. According to constructivist learning theories and as was commented by our experts, the social, behavioural and cognitive domains of learning go hand in hand[46]. Some of the study results did reveal this interaction, such as students reflecting on how they turned negative experiences into learning. Systematically acknowledging interactions between behaviour and cognition, in the terminology as well as in the methods, will contribute to our understanding of how and when individual students learn. Caution has to be taken though in labels such as 'learning styles' as one of the studies[24] did, in the absence of an accurate test of the premise of this interpretation. Finally, the appreciation of the learning potential of more negative experiences, calls for a closer examination of students' strategies to turn clinical situations into learning.

In this review, clinical learning has been studied from the viewpoint of the student as a learner, as opposed to the perspective of external factors affecting students' learning. However, as both this review and previous literature have demonstrated[2], learning is a social process that is highly dependent on the environment. If students feel supported by the team they will be more willing to take responsibility and actively create learning opportunities[47 48]. The current work adds to our understanding of the student's role within the complex structure of clinical nursing education and can be a starting point for future research on how individual interactions between students and their environment promote learning.

Limitations

The variety of concepts, processes, definitions and outcomes associated with learning in clinical practice proved challenging in determining the boundaries of our search. The selection was influenced by choice of terminology and framing of the authors of the studies. This review therefore provides insight into the current use of terminology as well as caveats in applying it. Limiting to nursing in the hospital setting excluded us from both theoretical and experimental research on practice learning in other health professions. However, this focus enabled us to synthesise specific findings from the different studies. The approach can be of interest for other health professions, and will eventually allow for comparison of the literature. Finally, our synthesis of learning activities is based on studies with heterogeneity in populations, setting, and year of publication, in which the same type of activity might have a different meaning. As we reinterpreted some of the data caution has to be taken in drawing firm conclusions[49]. Nevertheless, as the findings were recognised by experts and correspond with existing literature, the categories found are a good starting point for further study.

Conclusion

This review provides an overview of how learning in clinical practice has been addressed in the undergraduate nursing education literature. The number of studies that investigate examine how students learn during their days at the ward remains scarce and the quality of studies conducted is circumspect. Moreover, these studies often fail to align theoretical concepts with a corresponding operationalization and analysis of findings, therefore offering little guidance for which terminology to use in future studies. The studies on this topic reveal the importance of increased autonomy, learning form, peers, professionals and patients, and the cognitive appraisal of learning. This categorization may be a basis for the design and evaluation of clinical learning. There is still uncertainty about formal and informal components of learning and how they should be studied, as well as about desirable outcomes of clinical learning and how to incorporate them in research. Given the importance of students' active engagement with learning as well as reflection on it, behavioural and cognitive aspects of learning as well as their interactions should be explicitly addressed.

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FUNDING

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

COMPETING INTERESTS

The authors declare that they have no competing interests.

CONTRIBUTORS

MS, RAK, HED, SP, JCFK contributed to the research idea and study design and edited and revised the paper. MS and JCFK developed the search strategy and executed the search. MS and RAK identified and agreed eligible papers and extracted the data. MS wrote the manuscript. RAK led the supervision of the project.

PATIENT CONSENT

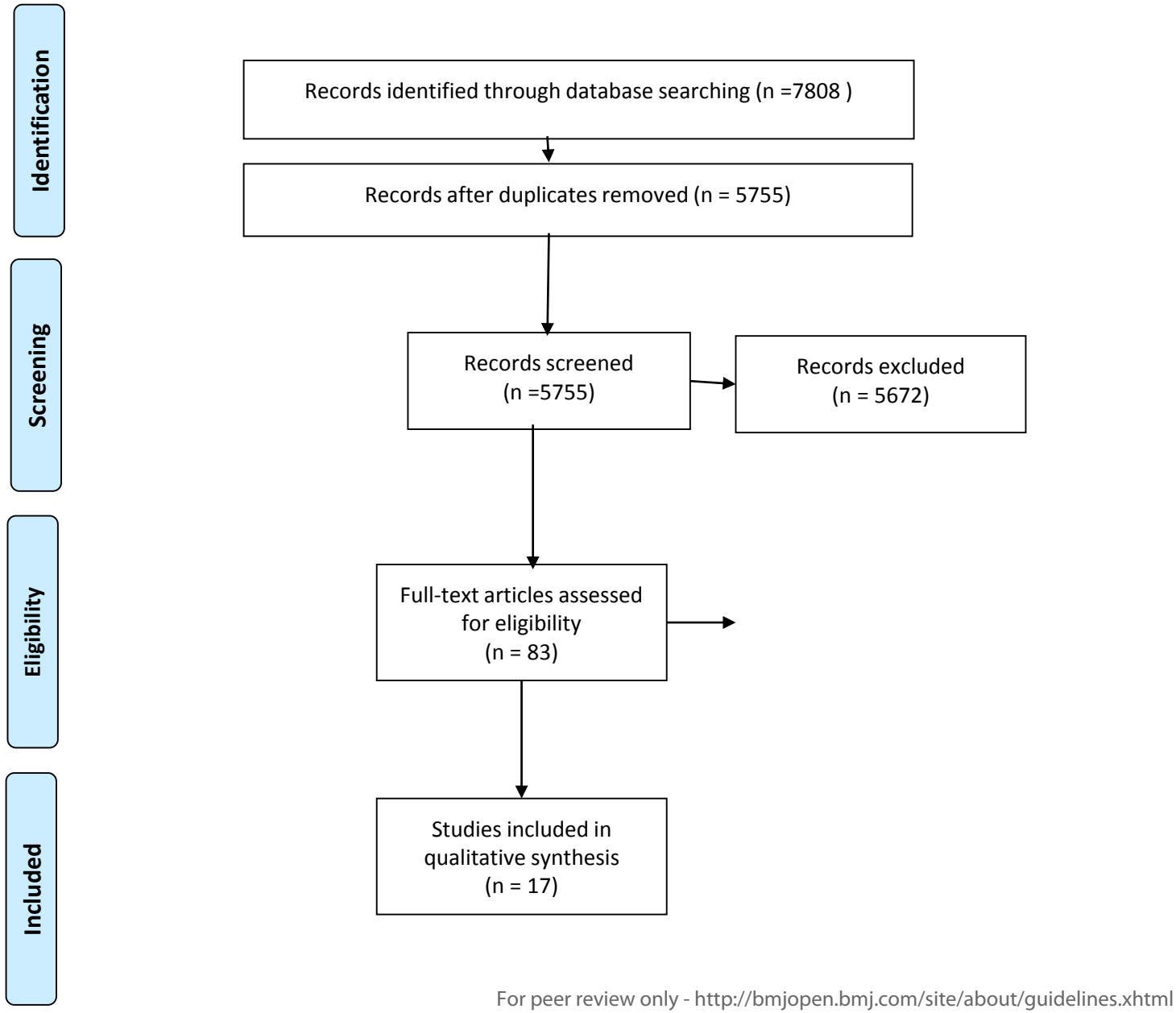
Not required.

DATA SHARING STATEMENT

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

FIGURES

Figure 1. Flow diagram article screening and selection search step 2


Identification
Screening
Eligibility
Included
Records identified through database searching (n =7808)
Records after duplicates removed (n = 5755)
Records screened
(n =5755)
Records excluded
(n = 5672)
Full-text articles assessed
for eligibility
(n = 83)
Studies included in
qualitative synthesis
(n = 17)

LEARNING ACTIVITIES				
Working as a nurse	Interacting with ward staff	Interacting with peers	Interacting with patients	Processing information

OPERATIONALISATIONS			
Interviews/narratives of students' experiences with learning in practice	Interviews/narratives of students' experiences of learning in practice focused on interactions	Observation of interactions involved in learning	Interviews about students' understanding of a specific concept

CONCEPTUALISATIONS			
Concepts synonym for practice learning	Concepts concerning social learning	Concepts appreciating the conscious, unplanned nature of clinical learning	Concepts appreciating the active role of students
• *Clinical learning experience* • *Workplace learning* • *Informal on the job learning* • *Clinical learning* • *Learning in the clinical workplace* • *Experiences of learning at a clinical ward* • *Learning in the workplace*	• *Peer learning* • *Peer assisted learning* • *Learning from patient stories* • *Learning in relation to encounters with others*	• *Experiential learnig* • *Informal learning* • *Learning from the hidden curriculum*	• *Learning styles in the clinical setting* • *Transformative learning*

PRISMA-ScR Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable) background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions or objectives lend themselves to a scoping review approach.	3
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (for example, population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions or objectives.	3
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (for example, a Web address); and if available, provide registration information, including the registration number.	4
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (for example, years considered, language, and publication status), and provide a rationale.	5
Information sources	7	Describe all information sources in the search (for example, databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	4 + supplementary file 3
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Supplementary file 3
Selection of sources of evidence	9	State the process for selecting sources of evidence (that is, screening and eligibility) included in the scoping review.	5
Data charting process	10	Describe the methods of charting data from the included sources of evidence (for example, calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	6
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	6
Critical Appraisal of Individual Sources of Evidence	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	6
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	N/A
Synthesis of results	14	Describe the methods of handling and summarizing the data that were charted.	6

PRISMA-ScR Checklist

Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	N/A
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	N/A
RESULTS			
Selection of Sources of Evidence	17	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	7
Characteristics of Sources of Evidence	18	For each source of evidence, present characteristics for which data were charted and provide the citations.	7
Critical Appraisal Within Sources of Evidence	19	If done, present data on critical appraisal of included sources of evidence (see item 12).	7-8
Results of Individual Sources of Evidence	20	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	9-18
Synthesis of results	21	Summarize or present the charting results as they relate to the review questions and objectives.	19-21
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	N/A
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	N/A
DISCUSSION			
Summary of evidence	24	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	22
Limitations	25	Discuss the limitations of the scoping review process.	23
Conclusions	26	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications or next steps.	24
FUNDING			
Funding	27	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	26

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, Moher D, Peters MDJ, Horsley T, Weeks L, Hempel S, Akl EA, Chang C, McGowan J, Stewart L, Hartling L, Aldcroft A, Wilson MG, Garritty C, Lewin S, Godfrey CM, Macdonald MT, Langlois EV, Soares-Weiser K, Moriarty J, Clifford T, Tunçalp Ö, Straus SE. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Ann Intern Med. 2018.

Protocol for a scoping review on the conceptualization of learning in undergraduate clinical nursing practice

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Word count

2385

Key words

Undergraduate nursing education, learning in practice

ABSTRACT

Introduction: Learning in the clinical setting is a major form of learning in undergraduate nursing education. In spite of this, how nursing students learn in clinical practice is still largely unknown. Moreover, there is no conceptual clarity on learning in practice in the current literature. This paper aims to set up a protocol for a scoping review of the literature in order to map different conceptualizations of learning in undergraduate clinical nursing practice in the hospital setting. The operationalisations of different concepts will be compared and the findings of the studies will be synthesized.

Methods and analysis: This scoping review will be guided by the methodological framework proposed by Arksey and O'Malley and refined by Levac et al. and the Joanna Briggs institute. The search strategy will be developed together with a medical information specialist and the search will be performed in electronic databases (PubMed, EBSCO/ERIC and EBSCO/CINAHL). In a first search, we will identify concepts that are used as an equivalent to learning in practice. Next we will search for studies operationalizing these concepts in undergraduate nursing education. Finally, we will check reference lists for additional publications. Abstracts and full-text studies will independently be screened by two researchers. All studies that have 'learning in undergraduate clinical nursing practice' as their main topic and that include a definition of operationalization of an equivalent to learning in clinical practice, will be considered for inclusion. We will chart different conceptualisations and their theoretical underpinnings, as well as reported learning opportunities, informal and formal aspects of learning, social aspects of learning and gaps in the literature.

Ethics and dissemination: This review will help design future studies on learning in clinical nursing practice using well-defined and agreed upon terminology. The results will be disseminated through journal publications and conference presentations.

ARTICLE SUMMARY

Strengths and limitations of this study

- This protocol outlines a rigorous design that includes an established research framework, a search strategy and a selection process.
- The search strategy includes different databases with peer-reviewed literature, with no restrictions to the study design or the publication date.
- The assessment of the quality of the included papers will enable identifying gaps in the literature.

- A limitation is that the literature search will only cover undergraduate nursing education, while a comparison with literature on learning in practice in other health professions would enrichen our understanding of potential conceptualizations.
- This study will not include books or grey literature, which will allow us to map how learning in practice is conceptualized in original research.

INTRODUCTION

Learning in the clinical setting is crucial for becoming a competent nurse[1]. However, how nursing students learn in clinical practice is still largely unknown. A vast body of knowledge exists on factors that influence learning, but the process itself remains underexposed [4]. For example, there is a lack of insight into how individual learning outcomes can be predicted, or which learning opportunities best promote students' learning [5]. Understanding learning in the clinical setting can help design, supervise and evaluate individual learning trajectories and their outcomes in practice. This study aims to set up a protocol for a scoping review to examine how different concepts that are equivalent to 'learning in practice' are used and operationalized in the literature, and what these studies add to our understanding of learning in the clinical setting

In the educational literature, the concept of 'learning in practice' has been widely studied in the context of workplace learning by professionals [6] or practice learning by students[7]. However, there is no unified definition or approach towards this concept[8]. Two main characteristics of clinical learning can be clearly distinguished in the literature. First, learning in practice is often distinguished from learning in the classroom setting as informal opposed to formal learning, where informal learning arises in situations where learning is not the primary aim[9]. However, some authors question the validity of a dichotomy between formal and informal learning[10], and state that every learning situation contains both formal and informal elements[11]. This would particularly apply to clinical learning, which is characterized by a constant interplay of the 'reality' of clinical practice and formal learning interventions such as feedback and assessment[12]. Another essential characteristic of workplace learning is its social rather than individual nature[13]. That is, learning occurs in interaction and dialogue with others [9].

In the nursing education literature, just as in other health professions education literature, different terms are used to describe and study learning in clinical practice, with different theoretical underpinnings. Moreover, the rationale behind the application of the concepts used is not always explained. Therefore, it is not always clear whether these different terms refer to the same concept, and how they are defined in terms of learning content (skills, knowledge, values), process (implicit,

explicit), control (intended or unintended, guided or not guided) and learning outcomes. Also, different researchers appear to apply the same concept differently. Having clear and agreed upon terminology can help design future studies that can contribute to understanding learning in clinical practice along with its limitations so that nursing wards can be organized for optimal benefit of the students.

The goal of this scoping review is to provide guidance for the use of concepts that describe learning in undergraduate clinical nursing practice in future studies. This study therefore aims to examine how different concepts that are equivalent to 'learning in practice' are used and operationalized in the literature. Therefore, we will look for studies that examine how learning in the clinical setting takes place. To enable comparison of the use of different concepts, we will focus on the general hospital setting. This context is the traditional setting for nursing training and comprises a variety of factors that may be relevant for learning, such as the presence of registered nurses, peers, and other professionals, as well as complex and acute patients, thereby offering a wide array of multidimensional learning opportunities [14]. We will particularly consider how formal and informal aspects of learning, as well as the social component of learning are included in these operationalisations. We will synthesize the results relating to how students learn in clinical practice.

A body of work on concepts to describe learning in practice does exist outside nursing education literature[15]. To our knowledge, the only study that included distinct concepts of learning in clinical practice in a review before, was a concept analysis of work-based learning in health care education by Manley, et al. [16]. The authors identified common attributes, enabling factors and consequences of workplace learning and proposed a definition. The current review will build on this work by closely examining different concepts of learning in practice in the context of undergraduate nursing education, as well as comparing how they are used to study clinical learning. This will enable us to address gaps in the literature as well as make suggestions for the use of terminology in future studies Also, the current study will include literature after 2009 when Manley, et al. [16] conducted their study. In interpreting our findings, we will consider the broader body of literature on learning in practice.

METHODS AND ANALYSIS

We decided to use the scoping review approach to map the different concepts that are used to study learning in clinical nursing practice as well as the way they are operationalised and the information they provide about how students learn in the clinical setting. Since the lack of a focused line of inquiry requires a broad research question, we consider a scoping review to be more appropriate than a systematic review. Scoping can help understand complex concepts through clarifying

definitions and conceptual boundaries[17]. Scoping will also enable us to identify key concepts, gaps in the literature, and types and sources of evidence to inform practice, policymaking, and research[18]. To get a comprehensive picture of the existing research, we will include studies with different designs. Since scoping reviews are hypothesis-generating rather than hypothesis-testing, this review can provide a stepping off point for further research.

Standardized reporting guidelines can help the critical appraisal of reviews and thereby increase their reproducibility, completeness, and transparency[19]. For systematic reviews, the PRISMA-P checklist has been developed to facilitate the preparation of a robust research protocol[20]. PRISMA guidelines for scoping reviews are still under development[21]. We therefore used relevant items of the PRISMA-P (Preferred Reporting Items for Systematic Reviews and Meta-analysis Protocols) to draft this protocol, as outlined in additional file 1.

To ensure rigor in reporting the methodology, we will use the six-stage approach developed by Arksey and O'Malley [22] and refined by Levac, et al. [23] and the Joanna Briggs institute [24] (1) identifying the research question; (2) identifying relevant studies; (3) selecting studies; (4) charting the data; (5) collating, summarizing and reporting the results; (6) expert consultation (optional and included).

Stage 1. Identifying the research question

Since our aim is to understand how learning in undergraduate clinical nursing practice is conceptualized in the current literature irrespective of research design and outcome, our research question is:

- How are different concepts that are used as an equivalent to learning in the hospital setting operationalized in the undergraduate nursing education literature?

As scoping is an iterative process [22], we might add additional questions based on our findings along the review process. While the eventual goal of this study is to contribute to the understanding of the process of nursing students' learning in practice, we will also synthesize results that are relevant to this topic.

Stage 2. Identify relevant studies

The search strategy will be iteratively developed by the research team. As suggested by the Joanna Briggs institute [24],we will start with a very broad search to inform our subsequent search strategy. A comprehensive search strategy will be developed (by MS and JCFK) to conduct this stepwise search

process following the Peer Review of Electronic Search Strategies (PRESS) 2015 guideline statement [25].

In an initial search (search step 1), we will combine the terms 'learning in clinical practice' and 'undergraduate nursing students'. The search query for both steps will first be developed for PubMed and later extended to EBSCO/ERIC and EBSCO/CINAHL to identify different concepts in the literature that are used as an equivalent to 'learning in clinical practice' by nursing students. See our draft search in the additional file 2 for step 1 of our search. The first 100 search results from each database will be reviewed by the researchers to assess validity of the search strategy. When agreement has been reached about the initial search strategy, the first 200 abstracts will be scanned by the two reviewers (MS and RAK) on concepts potentially eligible for inclusion in the second search step. Eligible concepts are concepts that describe the process of learning to become a nurse within the clinical context ('such as 'experiential learning' or 'informal learning'), rather than specific aspects or (such as 'skill acquisition' or 'peer learning'). In case of full agreement between the two reviewers on potentially eligible concepts, the first reviewer will screen the rest of the abstracts. In case of disagreement, the second author will scan another 200 abstracts until full agreement is reached. After all abstracts have been screened, the two reviewers will discuss all potentially eligible concepts and select concepts to be included in the second search step.

After having selected the different concepts, we will develop a search query (search step 2) in PubMed and subsequently extend to EBSCO/ERIC and EBSCO/CINAHL combining each of the identified concepts with 'undergraduate nursing' to find studies operationalizing one of the identified concepts in the literature on nursing students' learning in the hospital setting.

After these two searches, we will check reference lists for additional publications (See figure 1 for a flow diagram of the search and selection process). We will conduct the two searches in June 2018.

Stage 3. Study selection

Following the second step of our search strategy, two independent researchers will screen abstracts and assess the eligibility for full text retrieval. Selected full-text studies will again be compared between the reviewers with disagreement being resolved through discussion and consensus and with input from the full research team.

The inclusion criteria will be developed in an iterative process in which the reviewers calibrate a threshold for inclusion and exclusion. The initial inclusion criteria will be:

- Original research or reviews in peer reviewed journals that have learning in undergraduate clinical nursing practice in the hospital setting as one of their main topics, regardless of publication date and type of article.
- Studies that examine how students learn in the clinical hospital setting

Since we are interested in how learning in practice is operationalized in peer-reviewed research, we exclude books, book reviews, commentaries, letters to the editor, PhD theses, and reports. Reasons for exclusion will be documented at the full-text review stage.

Stage 4. Charting the data

Data will be extracted from full-text journal articles which meet the aforementioned inclusion criteria. A draft analytic frame is developed to document selected studies into an excel spreadsheet, including study characteristics (year, country, methodology, study question, study design, participants, outcomes, study quality), conceptualization of learning in practice (definitions, theoretical underpinnings/rationale, operationalisations, formal/informal aspects of learning, social interactions, learning opportunities)and reported gaps in the literature. Other categories that come during the data extraction progress will be discussed in the research team and added to the data extraction form. Although formal assessment of study quality is generally not performed in scoping reviews [24], some claim it should be incorporated in the methodology [18]. Assessing study quality will enable us to address not only quantitative, but also qualitative gaps in the literature[23]. We will therefore assess the quality of included studies by a set of quality indicators for reviews developed by Buckley, et al. [26].The form will be piloted on 5–10 articles by the team and will allow us to analyse the selected articles through a common framework.

We will document studies that are not selected for full text retrieval in a separate file. To ensure accurate data collection, each reviewer's independent charted data will be compared and any discrepancies will be iteratively discussed by the researchers to ensure consistency between the reviewers.

Stage 5. Collating, summarizing and reporting results

A PRISMA flow diagram will be used to report final numbers in the resulting study publication. As we expect a diverse body of knowledge, we will give a descriptive account of concepts and subsequent operationalizations. We will synthesise study findings using narrative descriptions based on themes that emerge from the extracted data. The results will be compared and consolidated through consensus between two of the r MS and RAK.

We will address both quantitative and qualitative gaps in the literature. We will discuss the data in the light of relevant theories on workplace learning both in and outside nursing education literature and make suggestions for the operationalization of learning in practice for future studies.

Stage 6. Expert consultation

In order to confirm our findings and interpretations, two nurse educators, with experience in scientific research and expertise on learning in clinical practice, will be approached for consultation.

ETHICS AND DISSEMINATION

This scoping review will be the first study to compare terminology used for learning in undergraduate nursing clinical practice and thereby will contribute to the design and comparison of future studies in this field. This protocol reports a comprehensive, rigorous and transparent methodology. The results will be disseminated through a peer-reviewed publication and national and international conferences such as the AMEE (Association of Medical Education in Europe) conference, targeting an audience involved in undergraduate nursing education. By identifying gaps in the current body of literature, this study can guide future nursing education research. Both the methodology and the results may be of interest for researchers and educators in other health professions than nursing, given the widely spread importance of learning in clinical practice. Since the methodology applied consists of reviewing and collecting data from publicly available materials, this study does not require an ethical approval.

PATIENT AND PUBLIC INVOLVEMENT

- *How was the development of the research question and outcome measures informed by patients' priorities, experience, and preferences?* As education is essential for improving patient care, patients will eventually benefit from the body of knowledge this study contributes to. However, specific interests of patients have not been examined.
- *How did you involve patients in the design of this study?* Patients have not been involved in the study.
- *Were patients involved in the recruitment to and conduct of the study?* No.
  How will the results be disseminated to study participants? As this concerns a review, this study has no participants.
- *For randomised controlled trials, was the burden of the intervention assessed by patients themselves?* Not applicable
- *Patient advisers should also be thanked in the contributorship statement/acknowledgements.* Not applicable
- *If patients and or public were not involved please state this.* Not applicable

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AUTHOR STATEMENT

MS and RAK were responsible for the initial design of this study MS, HED, RAK, SP, JCFK, contributed to the development of the eligibility and data extraction criteria JCFK, MS, HED, RAK, developed and executed the search strategy. MS and RAK are responsible for abstract and full-text screening. MS conceptualized the review approach and led the writing of the manuscript. MS, RAK, HED, SP, JCFK contributed and approved the final version of this protocol. RAK led the supervision of the manuscript preparation.

FUNDING

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

CONFLICT OF INTERESTS

The authors declare that they have no competing interests.

Supplementary file 3. Draft search strategy step 1 and 2

1. **Search strategy step 1**

PubMed (9 May 2018)

Search	Query	Items found
#1	"Students, Nursing"[Mesh] OR "Internship, Nonmedical"[Mesh:noexp] OR (nursing[tiab] AND student*[tiab]) OR ((nursing[tiab] OR nurse[tiab] OR nurses[tiab]) AND internship*[tiab])) AND ((("Clinical Competence"[Mesh] OR "Clinical Medicine"[Majr] OR clinical*[ti] OR clinical*[ot] OR practice*[ti] OR practice[ot]) AND ("Learning"[Mesh] OR learning*[tiab])) OR clinical learning*[tiab]	**3,586**

Ebsco/ERIC (9 May 2018)

Search	Query	Items found
S7	S1 AND S6	**408**
S6	S4 OR S5	**70,505**
S5	TI ("clinical learning*") OR AB ("clinical learning*")	**84**
S4	S2 AND S3	**70,505**
S3	DE "Learning" OR DE "Active Learning" OR DE "Adult Learning" OR DE "Associative Learning" OR DE "Aural Learning" OR DE "Cooperative Learning" OR DE "Discovery Learning" OR DE "Discrimination Learning" OR DE "Electronic Learning" OR DE "Experiential Learning" OR DE "Incidental Learning" OR DE "Intentional Learning" OR DE "Interference (Learning)" OR DE "Lifelong Learning" OR DE "Mastery Learning" OR DE "Multisensory Learning" OR DE "Nonverbal Learning" OR DE "Observational Learning" OR DE "Prior Learning" OR DE "Problem Based Learning" OR DE "Rote Learning" OR DE "Second Language Learning" OR DE "Sequential Learning" OR DE "Serial Learning" OR DE "Student Centered Learning" OR DE "Symbolic Learning" OR DE "Transfer of Training" OR DE "Transformative Learning" OR DE "Verbal Learning" OR DE "Visual Learning" OR DE "Workplace Learning" OR DE "Active Learning" OR DE "Adult Learning" OR DE "Associative Learning" OR DE "Paired Associate Learning" OR DE "Aural Learning" OR DE "Cooperative Learning" OR DE "Discovery Learning" OR DE "Discrimination Learning" OR DE "Electronic Learning" OR DE "Experiential Learning" OR DE "Field Experience Programs" OR DE "Internship Programs" OR DE "Job Shadowing" OR DE "Service Learning" OR DE "Incidental Learning" OR DE "Intentional Learning" OR DE "Interference (Learning)" OR DE "Lifelong Learning" OR DE "Mastery Learning" OR DE "Multisensory Learning" OR DE "Nonverbal Learning" OR DE "Perceptual Motor Learning" OR DE "Observational Learning" OR DE "Prior Learning" OR DE "Problem Based Learning" OR DE "Rote Learning" OR DE "Second Language Learning" OR DE "Sequential Learning" OR DE "Serial Learning" OR DE "Student Centered Learning" OR DE "Symbolic Learning" OR DE "Transfer of Training" OR DE "Transformative Learning" OR DE "Verbal Learning" OR DE "Visual Learning" OR DE "Workplace Learning" OR TI (learning*) OR AB (learning*)	**381,995**
S2	DE "Clinical Experience" OR TI (clinical* OR practice*) OR AB (clinical* OR practice*)	**205,148**

S1	DE "Nursing Students" OR TI ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*)) OR AB ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*))	**2,294**

Ebsco/CINAHL (9 May 2018)

Search	Query	Items found
S11	S1 AND S10	**3,209**
S10	S5 OR S9	**14,430**
S9	S3 AND S8	**12,924**
S8	MH "Clinical Competence+" OR TI (clinical* OR practice*)	**234,601**
S7	S1 AND S6	**5,669**
S6	S4 OR S5	**32,948**
S5	MH "Learning Environment, Clinical" OR TI ("clinical learning*") OR AB ("clinical learning*")	**2,388**
S4	S2 AND S3	**31,869**
S3	MH "Learning+" OR MH "Conditioning (Psychology)+" OR MH "Memory+" OR MH "Reinforcement (Psychology)+" OR MH "Problem Solving+" OR TI (learning*) OR AB (learning*)	**103,547**
S2	MH "Clinical Competence+" OR TI (clinical* OR practice*) OR AB (clinical* OR practice*)	**631,184**
S1	MH "Students, Nursing+" OR MH "Students, Nursing, Baccalaureate+" OR MH "Students, Nursing, Graduate+" OR TI ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*)) OR AB ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*))	**35,637**

2. **Search strategy and numbers of hits step 2**

2.1 search strategy

(***PubMed:*** *(concept*[tiab] OR (conceptpart1*[ti] AND conceptpart2*[ti]) OR (conceptpart1 [ot] AND conceptpart2*[ot])) If integral concept could not be found in the Index, this was composed with an AND relation.*

[Mesh] = Medical Subject Headings, keywords in PubMed
[tiab] = words in title or abstract
[ti] = words in title
[ot] = other terms, in particular author keywords
MH = mapped heading, keyword in CINAHL
DE = descriptor, keyword in ERIC

TI = words in title
AB = words in abstract

Search	PubMed	Ebsco/ERIC	Ebsco/CINAHL
#1	"Students, Nursing"[Mesh] OR "Internship, Nonmedical"[Mesh:noexp] OR ((nursing[tiab] OR nurse[tiab] OR nurses[tiab]) AND student*[tiab]) OR ((nursing[tiab] OR nurse[tiab] OR nurses[tiab]) AND internship*[tiab])	DE "Nursing Students" OR TI ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*)) OR AB ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*))	MH "Students, Nursing+" OR MH "Students, Nursing, Baccalaureate+" OR MH "Students, Nursing, Graduate+" OR TI ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*)) OR AB ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*))
#2	authentic learning*[tiab] OR (authentic*[ti] AND learning*[ti]) OR (authentic*[ot] AND learning*[ot])	TI (authentic* AND learning*) OR AB ("authentic learning*")	TI (authentic* AND learning*) OR AB ("authentic learning*")
#3	clinical learning*[tiab]	TI ("clinical learning*") OR AB ("clinical learning*")	TI (authentic* AND learning*) OR AB ("authentic learning*")
#4	clinical placement learning*[tiab] OR (clinical placement*[ti] AND learning*[ti]) OR (clinical placement*[ot] AND learning*[ot])	TI ("clinical placement"* AND learning*) OR AB ("clinical placement learning*")	TI ("clinical placement"* AND learning*) OR AB ("clinical placement learning*")
#5	(clinically based*[tiab] AND learning*[tiab])	TI ("clinically based" AND learning*) OR AB ("clinically based learning*")	TI ("clinically based" AND learning*) OR AB ("clinically based learning*")
#6	(experiential learning*[tiab] OR (experiential*[ti] AND learning*[ti]) OR (experiential*[ot] AND learning*[ot]))	DE "experiential learning" OR TI (experiential* AND learning*) OR AB ("experiential learning*")	MH "Experiential learning" OR TI (experiential* AND learning*) OR AB ("experiential learning*")
#7	experimental learning*[tiab] OR (experimental*[ti] AND learning*[ti]) OR (experimental*[ot] AND learning*[ot])	TI (experimental* AND learning*) OR AB ("experimental learning*")	TI (experimental* AND learning*) OR AB ("experimental learning*")
#8	hidden curriculum*[tiab] OR (hidden*[ti] AND curriculum*[ti]) OR (hidden*[ot] AND curriculum*[ot])	DE "hidden curriculum" OR TI (hidden* AND curriculum*) OR AB ("hidden curriculum*")	TI (hidden* AND curriculum*) OR AB ("hidden curriculum*")
#9	informal learning*[tiab] OR (informal*[ti] AND learning*[ti]) OR (informal*[ot] AND learning*[ot])	TI (informal* AND learning*) OR AB ("informal learning*")	TI (informal* AND learning*) OR AB ("informal learning*")
#10	learning by doing*[tiab] OR (learning*[ti] AND doing*[ti]) OR (learning*[ot] AND doing*[ot])	TI (learning* AND doing*) OR AB ("learning by doing*")	TI (learning* AND doing*) OR AB ("learning by doing*")

#11	"learning from experience*"[tiab]	TI "learning w1 experience*" OR AB "learning w1 experience*"	TI "learning w1 experience*" OR AB "learning w1 experience*"
#12	"learning through experience*"[tiab]	TI ("learning through experience*") OR AB ("learning through experience*")	TI ("learning through experience*") OR AB ("learning through experience*")
#13	(learning*[tiab] AND clinical placement experience*[tiab])	TI (learning* AND "clinical placement experience") OR AB ("learning from clinical placement experience*")	TI (learning* AND "clinical placement experience") OR AB ("learning from clinical placement experience*")
#14	practice based learning*[tiab] OR (practice based*[ti] AND learning*[ti]) OR (practice based*[ot] AND learning*[ot])	TI ("practice based*" AND learning*) OR AB ("practice based learning*")	TI ("practice based*" AND learning*) OR AB ("practice based learning*")
#15	practice learning*[tiab]	TI ("practice learning*") OR AB ("practice learning*")	TI ("practice learning*") OR AB ("practice learning*")
#16	learning from practice*[tiab]	TI (learning w1 practice*) OR AB (learning w1 practice*)	TI (learning w1 practice*) OR AB (learning w1 practice*)
#17	learning in practice*[tiab]	TI (learning w1 practice*) OR AB (learning w1 practice*)	TI (learning w1 practice*) OR AB (learning w1 practice*)
#18	(learning*[tiab] AND clinical practicum*[tiab])	TI (learning* AND "clinical practicum*") OR AB (learning w2 clinical practicum*)	TI (learning* AND "clinical practicum*") OR AB (learning w2 clinical practicum*)
#19	(learning*[tiab] AND clinical field*[tiab])	TI (learning* AND "clinical field*") OR AB (learning w2 clinical field*)	TI (learning* AND "clinical field*") OR AB (learning w2 clinical field*)
#20	(learning*[tiab] AND clinical context*[tiab])	TI (learning* AND "clinical context*") OR AB (learning w2 clinical context*)	TI (learning* AND "clinical context*") OR AB (learning w2 clinical context*)
#21	(learning*[tiab] AND clinical setting*[tiab])	TI (learning* AND "clinical setting*") OR AB (learning w2 clinical setting*)	TI (learning* AND "clinical setting*") OR AB (learning w2 clinical setting*)
#22	(learning*[tiab] AND clinical nursing environment*[tiab])	TI (learning* AND "clinical nursing environment*") OR AB (learning w2 clinical nursing environment*)	TI (learning* AND "clinical nursing environment*") OR AB (learning w2 clinical nursing environment*)
#23	(learning*[tiab] AND clinical environment*[tiab])	TI (learning* AND "clinical environment*") OR AB (learning w2 clinical environment*)	TI (learning* AND "clinical environment*") OR AB (learning w2 clinical environment*)
#24	learning on the job*[tiab] OR (learning*[ti] AND on the job*[ti]) OR (learning*[ot] AND on the job*[ot])	TI (learning* AND "on the job*") OR AB ("learning on the job*")	TI (learning* AND "on the job*") OR AB ("learning on the job*")
#25	workplace learning*[tiab] OR (workplace*[ti] AND learning*[ti]) OR (workplace*[ot] AND learning*[ot])	DE "workplace learning" OR TI (workplace* AND learning*) OR AB ("workplace learning*")	TI (workplace* AND learning*) OR AB ("workplace learning*")

#26	learning in the workplace*[tiab] OR (learning*[ti] AND workplace*[ti]) OR (learning*[ot] AND workplace*[ot])	TI (learning* AND "in the workplace*") OR AB ("learning in the workplace*")	TI (learning* AND "in the workplace*") OR AB ("learning in the workplace*")
#27	work based learning*[tiab] OR (work based*[ti] AND learning*[ti]) OR (work based*[ot] AND learning*[ot])	TI ("work based*" AND learning*) OR AB ("work based learning*")	TI ("work based*" AND learning*) OR AB ("work based learning*")
#28	work integrated learning*[tiab] OR (work integrated*[ti] AND learning*[ti]) OR (work integrated*[ot] AND learning*[ot])	TI ("work integrated*" AND learning*) OR AB ("work integrated learning*")	TI ("work integrated*" AND learning*) OR AB ("work integrated learning*")
#29	learning process*[tiab]	DE "Learning Processes" OR TI ("learning process*") OR AB ("learning process*")	TI ("learning process*") OR AB ("learning process*")
#30	"learning the practice of nursing"[tiab]	TI ("learning the practice of nursing*") OR AB ("learning the practice of nursing*")	TI ("learning the practice of nursing*") OR AB ("learning the practice of nursing*")
#31	(learning*[tiab] AND clinical nursing*[tiab])	TI (learning* AND "clinical nursing"*) OR AB ("learning clinical nursing*")	TI (learning* AND "clinical nursing"*) OR AB ("learning clinical nursing*")
#32	placement learning*[tiab] OR (placement*[ti] AND learning*[ti]) OR (placement*[ot] AND learning*[ot])	TI (placement* AND learning*) OR AB ("placement learning*")	TI (placement* AND learning*) OR AB ("placement learning*")
#33	"Self-Directed Learning as Topic"[Mesh] OR self directed learning*[tiab] OR (self directed[ti] AND learning*[ti]) OR (self directed[ot] AND learning*[ot])	TI ("self directed*" AND learning*) OR AB ("self directed learning*")	MH "Self directed learning" OR TI ("self directed"* AND learning*) OR AB ("self directed learning*")
#34	self regulated learning*[tiab] OR (self regulated [ti] AND learning*[ti]) OR (self regulated [ot] AND learning*[ot])	TI ("self regulated*" AND learning*) OR AB ("self regulated learning*")	TI ("self regulated*" AND learning*) OR AB ("self regulated learning*")
#35	situated learning*[tiab] OR (situated*[ti] AND learning*[ti]) OR (situated*[ot] AND learning*[ot])	TI (situated* AND learning*) OR AB ("situated learning*")	TI (situated* AND learning*) OR AB ("situated learning*")
#36	socialisation*[tiab]	TI (socialisation*) OR AB ("socialisation*")	TI (socialisation*) OR AB ("socialisation*")
#37	socialization*[tiab]	TI (socialization*) OR AB ("socialization*")	TI (socialization*) OR AB ("socialization*")
#38	student learning*[tiab]	TI ("student learning*") OR AB ("student learning*")	TI ("student learning*") OR AB ("student learning*")
#39	ward based learning*[tiab] OR (ward based*[ti] AND learning*[ti]) OR (ward	TI ("ward based" AND learning*) OR AB ("ward based learning*")	TI ("ward based" AND learning*) OR AB ("ward based learning*")

	based*[ot] AND learning*[ot])		

During the search and selection process, three concepts appeared in the literature that had been discarded before, but were added to the list of concepts to run the second search with after discussion in the research team. The total number of hits was calculated after this search.

Concept	PubMed	Ebsco/ERIC	Ebsco/CINAHL
#40	(peer learning*[tiab]) OR (peer*[ti] AND learning*[ti]) OR (peer*[ot] AND learning*[ot])	TI ("peer*" AND learning*) OR AB ("peer learning*")	TI ("peer*" AND learning*) OR AB ("peer learning*")
#41	Peer assisted*[tiab] OR (peer assisted*[ti] AND learning*[ti]) OR (peer assisted*[ot] AND learning*[ot]))	TI ("peer assisted*" AND learning*) OR AB ("peer assisted based learning*")	TI ("peer assisted*" AND learning*) OR AB ("peer assisted based learning*")
#42	(transformative learning*[tiab] OR (transformative*[ti] AND learning*[ti]) OR (transformative*[ot] AND learning*[ot]))	TI (transformative* AND learning*) OR AB ("transformative learning*")	TI (transformative* AND learning*) OR AB ("transformative learning*")

2.2 Number of hits per concept

	Concepts	Combination of searches with # from queries in the above table	PubMed (23 May 2018)	Ebsco/-ERIC (23 May 2018)	Ebsco/-CINAHL (23 May 2018)
1.	**Authentic learning**	#1 AND #2	32	6	23
2.	**Clinical learning/ clinically based learning/ clinical placement learning**	#1 AND (#3 OR #4 OR 5)	631	16	544
3.	**Experiential learning**	#1 AND #6	294	84	571
4.	**Experimental learning**	#1 AND #7	31	2	26
5.	**Hidden curriculum**	#1 AND # 8	26	1	18
6.	**Informal learning**	#1 AND #9	11	7	7
7.	**Learning by doing**	#1 AND #10	12	3	14
8.	**Learning clinical nursing/ learning the practice of nursing**	#1 AND (#30 OR #31)	205	0	31
9.	**Learning from/through experience/learning from clinical placement experience**	#1 AND (#11 OR #12 OR 13)	48	7	4
10.	**Learning in the clinical field/learning in the clinical context/ Learning in the clinical setting/Learning in the clinical nursing environment/learning in the clinical environment**	#1 AND (#19 OR #20 OR #21 OR #22 OR #23)	785	16	240
11.	**Learning on the job**	#1 AND #24	0	2	2

12.	**Learning process**	#1 AND #29	463	40	474
13.	**Learning in practice/learning form practice/ learning in practice environment/learning in practice setting/learning in a clinical practicum/practice learning/practice based learning**	#1 AND (#14 OR #15 OR #16 OR #17 OR #18)	176	10	205
14.	**Placement learning**	#1 AND #32	102	4	64
15.	**Practice based learning**				
16.	**Self directed learning**	#1 AND #33	1210	20	297
17.	**Self-regulated learning**	#1 AND #34	27	2	32
18.	**Situated learning**	#1 AND #35	25	4	17
19.	**Socialication/socialisation**	#1 AND (#36 OR #37)	380	35	372
20.	**Student learning**	#1 AND #38	543	66	663
21.	**Ward based learning**	#1 AND #39	0	1	2
22.	**Workplace learning/learning in the workplace/work based learning/work integrated learning**	#1 AND (#25 OR #26 OR #27 OR #28)	92	5	67
23.	**Peer learning***	#1 AND #40	106	4	31
24.	**Peer assisted learning***	#1 AND #41	23	0	3
25.	**Transformative learning***	#1 AND #42	60	17	19

** Search 23, 24 and 25 have been conducted on 16 september 2018.*

Supplementary file 4. List of potentially eligible concepts and their reason for inclusion/exclusion in the second search step after discussion.

	Inclusion?	Rationale
Active learning	no	Used exclusively for learning in the classroom setting
Authentic learning	yes	Is used as an equivalent to learning in clinical practice[1]
Blended learning	No	Used exclusively for learning in the classroom setting
case based learning	no	Used exclusively for learning in the classroom setting, simulation learning or online learning
clinical experience/ practice experience	no	Used to describe the overall experience of being in a clinical setting rather than the learning process
clinical learning	yes	Used as an equivalent to learning in clinical practice
clinical learning environment	no	Used to describe learning circumstances rather than the learning process itself
clinical learning model	no	Used to describe learning circumstances rather than the learning process itself
Clinical nursing education	no	Is used to describe the entire system (organization, supervision, contents etc.) within which learning takes place
clinical placement learning	yes	Used as an equivalent to learning in clinical practice
clinical skills learning	no	Used to describe a specific part (ie skills learning) of learning in clinical practice
clinically based learning	yes	Used as an equivalent to learning in clinical practice
Collaborative learning	no	Used to describe a specific way of organizing learning in clinical practice (ie learning in pairs)
concept-based learning	no	Used either for curriculum design of for specific learning activities in clinical practice
cooperative learning	No	Used to describing specific learning/ teaching activities
deep learning	no	Used exclusively for learning in the classroom setting, simulation learning or online learning
Deliberatie practice	No	Used to describing specific learning/ teaching activities
Didactic learning	No	Used exclusively for learning in the classroom setting
dual level learning	No	Used to describe a specific way of organizing classroom learning
empathy learning	no	Used to describe the learning of a specific skill (ie empathy)
Enquiry based learning	no	Used to describing specific learning/ teaching activities
Experiential learning	yes	Is as an equivalent to learning in clinical practice
Experimental learning	yes	Is as an equivalent to learning in clinical practice
Hidden curriculum	yes	Although this is not an equivalent to learning in practice, we decided to include this concept as it is used to

		describe a way in which knowledge and valued are transmitted in clinical practice outside specific teaching or learning activities
Informal learning	yes	Is used as an equivalent to learning in clinical practice
(Work) integrated learning	yes	Is (in some cases)[2] used as an equivalent to learning in practice
Integrative learning	No	Used for describing specific teaching and learning strategies
Intentional learning	no	Used to describe specific learning/ teaching activities[3] or competencies[4]
interprofessional learning	no	Used to describe a specific way of organizing learning in clinical practice (ie learning with and from other disciplines)
Learning by doing	yes	Used as an equivalent to learning in clinical practice
learning clinical nursing	yes	Used as an equivalent to learning in clinical practice
learning from/through experience	yes	Used as an equivalent to learning in clinical practice
learning from clinical placement experience	yes	Used as an equivalent to learning in clinical practice
learning from practice	yes	Used as an equivalent to learning in clinical practice
learning in a clinical environment	yes	Used as an equivalent to learning in clinical practice
learning in practice/ learning in practice environment/ learning in practice setting/learning in a clinical practicum	yes	Used as an equivalent to learning in clinical practice
Learning in the clinical field/learning in the clinical context/ Learning in the clinical setting/Learning in the clinical nursing environment/learning in the clinical environment	yes	Used as an equivalent to learning in clinical practice
learning in the practice setting	yes	Used as an equivalent to learning in clinical practice
Learning on the job	yes	Used as an equivalent to learning in clinical practice
Learning on the workplace/ workplace learning/learning in the workplace	yes	Used as an equivalent to learning in clinical practice
learning process	yes	Used as an equivalent to learning in clinical practice[5]
Learning situation	no	Used to describe learning circumstances rather than the learning process itself
learning the practice of nursing	yes	Used as an equivalent to learning in clinical practice[6]
learning through experience	yes	Used as an equivalent to learning in clinical practice
learning trajectories	no	Used to describe learning in a specific program[7]
Meaningful learning	no	Used exclusively for learning in the classroom setting[8] or simulation learning[9]
Online learning	no	Used for specific learning activities outside the clinical

		setting
Peer based learning/ peer learning/ peer assisted learning	yes[1]	Used to describe a specific central way learning in clinical practice
Perceptual learning	no	Used to describe a specific technique to learn in clinical practice
placement learning	Yes	Used as an equivalent to learning in clinical practice
Practice learning	Yes	Used as an equivalent to learning in clinical practice
Practice-based learning	Yes	Used as an equivalent to learning in clinical practice
problem-based learning/ problem based learning	no	Used exclusively for learning in the classroom setting, simulation learning or online learning
professional development	No	Used to describe the result of learning in the clinical setting, rather than the process
Reflective learning	No	Used to descrive specific teaching and learning strategies
Self-directed learning	yes	Used (at least in some studies, eg [10]) to describe a very important component of learning in the clinical setting, that is, the part that takes place at the learner's initiative).
Self-regulated learning	yes	Used (at least in some studies, eg[11]) to describe a major part of learning in the clinical setting, that is, the part that takes place at the learner's initiative).
Service learning	no	Used for the particular combination of providing (voluntary) community service and learning in practice
Shared learning	No	Used to describe a specific way of organizing learning in clinical practice (ie learning from and with others)
Situated learning	yes	Used as an equivalent to learning in clinical practice, [12]
socialisation/ socialization	yes	Used to describe a major part of learning in clinical practice
student learning	yes	Is, in some cases (eg [13]) used to describe learning in clinical practice)
task-based learning	No	Used to describe a specific way of organizing learning in clinical practice (ie around tasks[14])
team-based learning	No	Used exclusively for learning in the classroom setting
Transformational learning	No	Used to describe the result of learning in the clinical setting, rather than the process[15]
Transformative learning	yes[2]	Used to describe both process and outcomes of learning [16]
Ward based learning	Yes	Used as an equivalent to learning in clinical practice
Work-based learning	Yes	Used as an equivalent to learning in clinical practice
work-integrated learning	Yes	Used as an equivalent to learning in clinical practice

[1] Excluded in first instance as it appeared to be used to study interventions or specific organizational models. On the basis of results in search step 2, the concept was included in second instance.
[2] Excluded in first instance as it appeared to be used to study classroom learning only. On the basis of results in search step 2, the concept was included in second instance.

workplace learning	Yes	Used as an equivalent to learning in clinical practice

Supplementary file 5. Excluded full text articles and main reason for exclusion

1.	Not been able to retrieve full text of this study
2.	Study is about influencing factors, interventions, organizational models, personal characteristics affecting learning instead of the learning process itself
3.	Study is not about learning/ not possible to separate findings about learning from other findings
4.	No original study or review
5.	Study is incomplete (eg no results)
6.	Study is about a research methodology
7.	Another study within the same project is already included, this study offers no additional findings
8.	Study is too specific
9.	Study is not about clinical practice/ not possible to separate findings about clinical practice from other findings
10.	Study is not about nursing students/not about hospital setting

	1	2	3	4	5	6	7	8	9	10
	x									
Abe (1977)	x									
Allan, Smith, and O'Driscoll (2011)		x								
Alves and Cogo (2014)			x							
Andrade Bezerra, Soares Campos, and Da Silveira (2005)	x									
Arlton and Miercort (1980)				x						
Arrigoni et al. (2017)				x						
Baldwin, Mills, Birks, and Budden (2014)		x								
Barry, Ward, and Walter (2017)						x				
Brackenreg (2004)		x								
Burnard (1991)				x						
Burnard (1992)							x			
Charneia (2007)	x									
Coetzee (2004)								x		
Cope, Cuthbertson, and Stoddart (2000)		x								
Corbett (1973)		x								
Cowman (1998)		x								
Crouch (1991)	x									
Cullingford (1991)	x									
de Jesus, Sena, and Andrade (2014)									x	
de Jesus et al. (2014)		x								
Durgante Alves and Petersen Cogo (2015)			x							
Edwards (2013)						x				
Egginton (2002)	x									
Endacott, Scholes, Freeman, and Cooper (2003)		x								
Evans (1987)				x						
Friedman (1981)	x									
Green and Holloway (1997)						x				
Hauge (1999)	x									
Hauge (1999)	x									
Henderson et al. (2018)		x								
Henderson et al. (2018)	x									
Hill (2016)			x							
Hold, Blake, and Ward (2015)									x	
Holmsen (2010)		x								

Ironside, McNelis, and Ebright (2014)			x							
Kosowski (1995)									x	
Kuiper (2004)		x								
Levett-Jones (2007)				x						
Love (1996)		x								
MacFarlane and Hart (1995).				x						
May and Veitch (1998)		x								
Montagna, Benaglio, and Zannini (2010)		x								
More and Conklin (1995)		x								
Newton, Billett, and Ockerby (2009)		x								
Nolan (1998)			x							
O'Shea (2003)									x	
Paliadelis and Wood (2016)		x								
Papp, Markkanen, and Von Bonsdorff (2001)	x									
Polifroni, Packard, Shah, and MacAvoy (1995)			x							
Rajeswaran (2016)		x								
Reutter, Field, Campbell, and Day (1997)			x							
Rodríguez García, Ruiz López, González Sanz, Fernández Trinidad, and De Blas Gómez (2014)			x							
Sandvik et al. (2012)		x								
Shahsavari, Zare, Parsa-Yekta, Griffiths, and Vaismoradi (2018)			x							
Shin (2000)			x							x
Shirazi, Sharif, Molazem, and Alborzi (2017)									x	
Skaalvik, Normann, and Henriksen (2010)		x								
Smith and Morrison (2006).										x
Spouse (2001)			x							
Tagliareni (1991)	x									
Thrysoe, Hounsgaard, Dohn, and Wagner (2010).			x							
Tupala, Tossavainen, and Turunen (2004)										x
Vesanto and Munnukka (1996)	x									
Wilson (1994)			x							
Wong and Lee (2000)										x
Zhao, Kuan, Chung, Chan, and Li (2018).						x				

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BMJ Open

How do undergraduate nursing students learn in the hospital setting? A scoping review of conceptualisations, operationalisations and learning activities.

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2019-029397.R2
Article Type:	Original research
Date Submitted by the Author:	02-Oct-2019
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Primary Subject Heading:	Nursing
Secondary Subject Heading:	Research methods
Keywords:	Nursing, EDUCATION & TRAINING (see Medical Education & Training), MEDICAL EDUCATION & TRAINING, Clinical learning

How do undergraduate nursing students learn in the hospital setting? A scoping review of conceptualisations, operationalisations and learning activities.

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Word count

4030

Key words

Undergraduate nursing education, learning in practice

ABSTRACT

Objectives. Although clinical learning is pivotal for nursing education, the learning process itself as well as the terminology to address this topic remain underexposed in the literature. This study aimed to examine how concepts equivalent to "learning in practice" are used and operationalised and which learning activities are reported in the nursing education literature. The final aim was to propose terminology for future studies.

Design The scoping framework proposed by Arksey and O'Malley was used to answer the research questions and address gaps in the literature. Two systematic searches were conducted in PubMed, EBSCO/ERIC and EBSCO/CINAHL between May and September 2018; first to identify concepts equivalent to 'learning in practice' and second to find studies operationalising these concepts. Eligible articles were studies that examined the regular learning of undergraduate nursing students in the hospital setting. Conceptualisations, theoretical frameworks and operationalisations were mapped descriptively. Results relating to how students learn were synthesised using thematic analysis. Quality assessment was performed using the Critical Appraisal Skills Programme (CASP) checklist.

Results From 9360 abstracts, 17 articles were included. Five studies adopted a general, yet not explained, synonym for learning in practice, the other approaches focused on the social, unplanned, or active nature of learning. All studies used a qualitative approach. The small number of studies and medium study quality hampered a thorough comparison of concepts. The synthesis of results revealed five types of learning activities, acknowledged by an expert panel, in which autonomy, interactions, and cognitive processing were central themes.

Conclusions Both theoretical approaches and learning activities of the current body of research fit into experiential learning theories, which can be used to guide and improve future studies. Gaps in the literature include formal and informal components of learning, the relation between learning and learning outcomes, and the interplay between behaviour and cognitive processing.

ARTICLE SUMMARY

Strengths and limitations of this study

- This study followed a rigorous design, using an established research framework, a comprehensive two-step search strategy and a well-documented selection process.
- The analysis of both conceptualisations, study quality and study results allowed for the identification of quantitative and qualitative gaps in the literature.

- A limitation is that the literature search only covered undergraduate nursing education in the hospital setting, while a comparison with literature on learning in practice in other health professions would enrichen our understanding of potential conceptualisations.

INTRODUCTION

Learning in the clinical setting is crucial for becoming a competent nurse[1]. However, although a vast body of knowledge exists on factors that influence learning, the process itself remains underexposed in the literature[2]. Understanding learning in the clinical setting can help design, supervise and evaluate individual learning trajectories. In the nursing education literature, just as in other health professions education literature, different terms are used to describe and study learning in clinical practice, with different underlying theoretical or conceptual frameworks.

This study aimed to examine how different concepts equivalent to "learning in practice" are used and operationalised and which learning activities are reported in the nursing education literature. The final aim was to propose a terminology to guide future studies. To our knowledge, the only study that included distinct concepts of clinical learning in the health setting in a review before, was a concept analysis of work-based learning in health care education from 2009[3]. The authors identified common attributes, enabling factors and consequences of workplace learning and proposed a definition. The current review built on this work by critically examining the use of these concepts within the context of undergraduate nursing education and by analysing their outcomes.

To enable comparison of the literature, this study focused on undergraduate students in the general hospital setting. This context is the traditional setting for nursing training and offers a wide array of multidimensional learning opportunities[4] through the presence of different healthcare professionals and students, as well as complex and acute patients. Moreover, this study is limited to undergraduate (also called bachelor, diploma or associate degree) education, which is the initial training that prepares for registration as a nurse, in which students learn the profession and shape their identity. As a final demarcation allowing for the contrasting of concepts, we focused on studies about how students learn during their regular day to day work at the ward, instead of evaluations of specific interventions or models.

METHODS AND ANALYSIS

The scoping review approach was chosen, as it can help understand complex concepts through clarifying definitions and conceptual boundaries[5] and enables to identify key concepts and gaps in the literature[6]. The approach developed by Arksey and O'Malley [7] and refined by Levac, et al. [8] and the Joanna Briggs institute[9] was used, consisting of the six stages (1) identifying the research question; (2) identifying relevant studies; (3) selecting studies; (4) charting the data; (5) collating, summarising and reporting the results; (6) expert consultation. Reporting on this scoping review followed the PRISMA Extension for Scoping Review checklist[10], as outlined in supplementary file 1. The review followed an a priori developed research protocol [11] (see supplementary file 2) with a little

deviation by choosing the Critical Appraisal Skills Programme (CASP) checklist[12] over the quality indicators of Buckley et al. [13], as this allowed for more specific and systematic quality assessment. As anticipated, study questions and refined inclusion criteria were added during the search process.

Stage 1. Identifying the research question

The original research question was:

"How are different concepts that are used as an equivalent to learning in the hospital setting operationalised in the undergraduate nursing education literature? ."

As scoping is an iterative process[7], the following research question was added based on the findings along the search process:

"Which activities do undergraduate nursing students learn from in the clinical setting?"

Stage 2. Identifying relevant studies

As suggested by the Joanna Briggs institute[9], a comprehensive search strategy was iteratively developed (by MS and JCFK) following the Peer Review of Electronic Search Strategies (PRESS) 2015 guideline statement[14], starting with a broad search (search step 1) to inform the subsequent search strategy (search step 2). The different search queries were first developed for PubMed and later extended to EBSCO/ERIC and EBSCO/CINAHL. See our search strategy for both steps in supplementary file 3.

In search step 1, from inception to May 2018 the terms 'learning in clinical practice' and 'undergraduate nursing students' were combined to identify concepts that are used as an equivalent to 'learning in clinical practice' and that could be included in the second search step. Eligible concepts were those relating to the process of clinical learning rather than specific aspects of it or associated factors. The first 200 abstracts were screened by the two reviewers (MS and RAK) independently to extract potentially eligible concepts. As the two reviewers reached full agreement on potentially eligible concepts within these first 200 abstracts, the first reviewer screened the rest of the abstracts. After all abstracts had been screened, all concepts were discussed between the two reviewers and a final selection of concepts to be included in the second search step was made. Disagreements were resolved through comparison of the concepts with the inclusion criteria, based on their use within the abstract. Potentially eligible concepts of which the meaning remained unclear after discussion, were also added to the list of concepts to be used in search step 2. Other concepts coming up during the search and selection process that appeared eligible, were added to the selection of concepts

after discussion between the reviewers. See supplementary file 4 for concepts and reason for inclusion/exclusion in the second search step.

In search step 2, between May and September 2018 each of the identified concepts was combined with 'undergraduate nursing students' to find studies operationalising these concepts in the literature about nursing students' learning in practice. After these two searches, reference lists of included studies were checked for additional publications meeting inclusion criteria.

Stage 3. Study selection

Two researchers (MS and RAK) independently screened abstracts from search step 2 and assessed the eligibility for full text retrieval. Selected full-text studies were compared between the reviewers with disagreements being resolved through discussion and consensus and with input from the full research team.

The inclusion criteria were developed iteratively. The initial inclusion criteria were:

- Original research or reviews in peer reviewed journals that have learning in undergraduate clinical nursing practice in the hospital setting as one of their main topics, regardless of publication date and type of article.
- Studies that examine how students learn in the clinical hospital setting.

In line with the aim of the study, the inclusion criteria were refined to:

- Original research or reviews in peer reviewed journals, regardless of publication date, type of article and study quality, that examine the learning of undergraduate nursing students in the clinical hospital setting as it regularly occurs.

Resulting in the following exclusion criteria:

Studies:

- evaluating organisational models or interventions
- about factors influencing learning in clinical practice, including supervision styles, teaching methods and clinical learning environment
- outside the general hospital setting
- about very specific student populations, patient populations or settings (e.g. palliative care) generating results that might be limited to that setting
- about interprofessional learning
- about the acquisition of specific skills

- about student's 'experience' of clinical learning *without explicit reference to the learning process.*

As the study aimed to examine how learning in practice is operationalised in peer-reviewed research, books, book reviews, commentaries, letters to the editor, PhD theses, and reports were excluded.

Stage 4. Charting the data

Selected studies were documented including study characteristics (year, country, methodology, study question, study design, participants, outcomes), conceptualisation of learning in practice (definitions, theoretical underpinnings/rationale, operationalisations), results, learning activities, and study quality. Two researchers piloted and refined the data extraction form on the first five studies. The completed form was discussed in the research team for accuracy and validity. Learning activities were extracted by two reviewers independently (MS and RAK), the other variables were initially charted by the first reviewer and checked by the second reviewer. Learning activities were separated from other study results by going through the result sections of the studies and underlining findings (themes, observations, quotes) that referred to how nursing students learn in the hospital setting. When possible, the original wordings were used in the data chart. Colloquial expressions that lost meaning outside the context of the article, were slightly rephrased. Although formal assessment of study quality in scoping reviews is debated [6 9], quality assessment of included studies by the CASP checklist[12] was decided upon to address qualitative gaps in the literature[8].

Stage 5. Collating, summarising and reporting results

Data were analysed in two ways. First, descriptive accounts of concepts, theories, subsequent operationalisations and study quality were given and compared. Second, a data driven thematic analysis of learning activities was conducted[15]. These findings were categorised using open coding. All the results were compared and consolidated through consensus between MS and RAK.

Stage 6. Expert consultation

In order to confirm our findings, we presented our analysis of the learning activities to four experts of different institutions in the Netherlands (a senior clinical educator, a coordinator of clinical education, a head of nursing education department, and a coordinator of nursing education). Short semi-structured (telephone) interviews were conducted, in which a written summary of the findings was presented and respondents were asked a) whether they recognised the findings, b) whether they missed anything, c) whether they had any other comments on the findings.

Patient and public involvement

As education is essential for improving patient care, patients will eventually benefit from the body of knowledge this study contributes to. However, specific interests of patients have not been investigated. Patients have not been involved in the design or the conduct of the study. The consulted experts can be considered participants of this study, and will be informed about the results as soon as it has been published.

RESULTS

Search results

This initial search to identify concepts yielded 7211 abstracts, of which 5658 remained after removing duplicates. As the two reviewers (MS and RAK) reached full agreement on potentially eligible concepts after screening the first 200 abstracts, the remaining abstracts were screened by MS only. Seventy potentially eligible concepts were extracted. After discussion between the reviewers, 22 concepts were selected, to which three concepts were added later in the process, so the second search was run with 25 different concepts. See supplementary file 4 for concepts and reason for inclusion/exclusion in search step 2. The second search, using the 25 concepts selected in the initial search, generated 9360 results of which 5880 remained after duplicates were removed. 83 abstracts were selected for full text reading and 17 studies were included (see supplementary file 5 for excluded full texts and reason for exclusion). Three pairs of studies were based on (partly) overlapping data[16-21], but were all included as the results only partly overlapped. Reference list screening of the full text articles did not generate any extra results. See Figure 1 For a flow diagram of search step 2.

General study characteristics

All included studies examined the process of undergraduate nursing students' learning in the clinical setting, as a result of their primary aim or as a significant secondary finding of a broader research question. Six of the studies[18-23] investigated undergraduate nursing students' learning in both the classroom setting and the clinical setting. One of the studies included not only nursing students, but also midwifery and social work students[24]. However, data presentation in the current study is restricted to findings concerning nursing students in the clinical setting. All were primary studies, of which sixteen were qualitative studies, and one mixed methods[21]. Publication year ranged from

1987-2018. Studies were conducted in different countries in Europe, Middle East, North America and Oceania.

Study quality

Table 1 shows the quality of the included studies as assessed with the Critical Appraisal Skills Programme (CASP) tool[12]. In the only mixed method study included[21], the quantitative data was analysed only descriptively and was used to inform the qualitative data. Therefore, this study was also appraised with the CASP. To summarise, in the majority of studies it was unclear how the results answered the research question, because of a lack of clear aims, lack of clear operationalisation, or both, in spite of clear descriptions of the process of data analysis and its outcomes.

	Baraz, et al. [25]	Burnard [20]	Burnard [21]	Carey, et al. [26]	Dadgaran, et al. [27]	Gidman [24]	Grealish and Ranse [28]	Green and Holloway [22]	Kear [18]	Kear [19]	Manninen [16]	Manninen, et al. [17]	Mayson and Hayward [29]	Roberts [30]	Seylani, et al. [23]	Stockhausen [31]	Windsor [32]
Was there a clear statement of the aims of the research?	yes	No	yes	yes	no	yes	yes	No	no	no	no	yes	yes	yes	no	yes	yes
Is a qualitative methodology appropriate?	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Was the research design appropriate to address the aims of the research?	yes	can't tell	yes	yes	no	yes	Can't tell	Can't tell	yes	Can't tell	yes	yes	yes	yes	no	yes	yes
Was the recruitment strategy appropriate to the aims of the research?	yes	can't tell	yes	yes	can't tell	yes	can't tell	can't tell	yes	can't tell	can't tell	can't tell	can't tell	can't tell	yes	no	no
Was the data collected in a way that addressed the research issue?	yes	can't tell	can't tell	yes	yes	can't tell	yes	Can't tell	Can't tell	yes	Can't tell	yes	yes	yes	Can't tell	yes	yes
Has the relationship between researcher and participants been adequately considered?	no	can't tell	can't tell	yes	no	yes	yes	No	no	no	no	can't tell	yes	can't tell	no	no	no
Have ethical issues been taken into consideration?	yes	can't tell	Can't tell	yes	yes	yes	can't tell	no	yes	can't tell	can't tell	yes	yes	yes	yes	yes	no
Was the data analysis sufficiently rigorous?	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	can't tell	yes	yes	can't tell	yes	yes	yes
Is there a clear statement of findings?	yes	Yes	No	yes	no	yes	yes	no	yes	yes	no	yes	yes	yes	yes	yes	yes

Table 1. quality of the included studies as assessed with the Critical Appraisal Skills Programme (CASP)[12] tool

Concepts, operationalisations and learning activities

Table 2 summarises the main concepts, operationalisations, frameworks, findings and learning activities of the 17 selected studies. Findings concerning conceptualisation and operationalisation as well as the results concerning learning activities will be discussed in the following paragraphs.

	Conceptualisation			**Operationalisation**	**Learning activities**	
	Main term(s) used to describe learning in practice *definition, if provided, in italics*	**Main concept studied** *Definition, if provided, in italics*	**Theoretical or conceptual framework for interpreting results/explicit reference to learning theories**	**Summary of operationalisation**	**Main study results, arranged according to the studies' objectives**	**Learning activities for nursing students in the hospital setting, identified by the reviewers in the studies' result sections**
Baraz, Memarian, and Vanaki (2014)	Learning process in clinical setting	Learning styles in clinical setting *Individual's preferred methods of knowledge and skill acquisition and information organization.*	No theoretical framework, used, reference to Kolb's stages of experiential learning	Semi-structured interviews about what and how students learn in the clinical setting.	Three clinical learning styles 1. Thoughtful observation 2. Learning by doing 3. Learning by thinking	- careful observation of role models performance - reflective observation during clinical rounds - participating in medical rounds - clinical rounds - nursing rounds by instructors and classmates - active involvement in procedures - caring for sensitive patients - Active collaboration with peers - maintaining continuity by making active patient contact and repeating nursing procedures - assuming responsibility for patient care - memorizing info by history taking - accountability for clinical homework - inquiring staff and peers - critical thinking

						- monitoring, critiquing, avoiding unsafe practice
Burnard (1992b)	Clinical experiences	Experiential learning *'experiential learning' has been used to describe many different sorts of educational approaches ranging from the use of interactive group strategies) to accrediting people for their life experience when considering those people for entrance to courses*	No theoretical framework, used, reference to Kolb's stages of experiential learning	In depth interviews about how students perceive experiential learning	Definitions of experiential learning: a. something more than just being taught b. something that you use when you use your own experience c learning in the clinical setting	- just doing - just being there - learning by seeing - selecting one of the nurses as a role model - being personally involved and immersed in the learning situation
Burnard (1992a)	Clinical experiences	Experiential learning No definition provided with justification: *'it appears that the term can be used by different people in different ways'*	No theoretical framework, used, reference to Kolb's stages of experiential learning	Interviews about how students and tutors experience experiential learning and questionnaire about perceptions of experiential learning	Experiential learning 1. is learning by doing 2. is personal learning 3. involves reflection Students mostly relate experiential learning to learning in the clinical setting.	- learning by taking part - not only doing but also reflecting. - observing role models
Carey, Chick, Kent, and Latour (2018)	Learning in clinical settings/ learning within the clinical practice environment; Clinical learning	Peer assisted learning *in which students acquire skills and knowledge through the active help provided by status equals or matched*	-	Observation of interaction patterns between students	Three themes contributing to impact of peer assisted learning: - peers as facilitators to develop learning - working together as peers to develop clinical practice and deliver care - positive support and interaction from peers to enhance networking	- watching demonstrations by other students - asking questions - seeking advice and guidance - discussing development plans - discussing practice standards - challenging each other's knowledge - Sharing roles

		companions (Topping, 2005).			and develop working structure.	- sharing experiences of clinical practice - discussing challenges of finding one's way in the clinical environment
Dadgaran, Parvizy, and Peyrovi (2012)	Clinical learning	Clinical learning	-	semi-structured interviews about how students experience their clinical learning; subsequent observations of students in the clinical setting with a focus on interactions	Five categories and one 'core variable': 1. facing unfavourable clinical facts 2 analysis of a clinical situation and appropriate decision making 3. bridging the gap between practice and theory 4. struggle for clinical independence 5. Dynamism 6. struggle to acquire clinical competence Two approaches to learning: 1. Microlearning 2. Macrolearning	- trying to figure out what regulations are and what they should be through detection of the environment - modify learning deficits to fight the feeling of being unable to answer questions - try to analyse the situation and make an appropriate decision - increase theoretical knowledge through reading books and asking questions - in the ward, review already learned materials (reconstructive thinking) - analysis of clinical issues (clinical reasoning) - making links between theory and practice - design care plans - organizing care on the basis of self-made care plans - doing tasks independently
Gidman (2013)	Learning in practice	Learning from patient stories	No theoretical framework, used, reference to Eraut's theory on informal learning	Conversational interviews about students' perceptions of their learning experiences of listening to patient stories.	1. Students value listening to stories for learning 2. students develop relationships with patients 3. students learn from the subjective and emotional perspective of patients 4. students think back to their own personal stories when caring for	- listening to patients' personal stories - building relationships with patient - listening to relatives of a patient - reflecting on personal experiences

					patients 5. listening to stories has a positive impact on understanding patients and a commitment to patient care.	
Grealish and Ranse (2009)	learning in the workplace, clinical learning	Learning in the clinical workplace	Community of practice	Students' written narratives about where they learned while on clinical placement.	Three thematic constructs, called 'learning triggers': a. participation (or observation) of a task or procedure that leads to (takes them into) a complex, dramatic reading of nursing work b. being personally (emotionally) confronted by the work (high challenge) c. meeting nurses who contribute to the development of an image of what the students wants to be as a nurse	- being involved in the practical aspects of caring for a patient - shifting focus from the task to the person - talking to patients' relatives - looking at the patient as a person, taking an interest in their needs - engaging in post-operative observations - assisting patients in little things - giving medications - Being personally (emotionally) confronted by the work - experiencing positive and negative emotions - taking responsibility - talking to patients - meeting nurses who contribute to the development as an image - identifying a resident nurse as a role model - receiving feedback from resident nurses - aligning personal practice with what is observed - working independently in a supportive surrounding - witnessing poor practice
Green and Holloway (1996)	Learning in the clinical setting	experiential learning	No theoretical framework, used,	Non-directive interviews about students'	6 themes: a. Students were able to define experiential learning, usually	- working with the client (including the intuitive element) - participating, interacting, shared

			reference to Kolb's stages of experiential learning	understanding, experience and interpretation of experiential learning.	encapsulating both classroom and clinical experience. The importance of the experience itself appeared fundamental. b. Role play is identified as the main example of experiential teaching and learning. c. Students were aware of the issues arising from the problematic relationship between theory and practice. d. The importance of reflection as a stage in experiential learning and of reflective practice was highlighted indicating diversity in application. e. Concerns regarding clinical practice. f. The importance of clinical supervision viewing it as experiential learning.	learning with peers. - evaluating nursing models - reflecting. - sharing experiences. - selecting from previous experience to contribute to new ones - practicing of skills - practicing with people. - patient care - non-threatening supportive collaboration with a colleague - learning form practice and reflection - involving clients - reflecting in the form of a portfolio - maintaining personal journals
Kear (2009)	Clinical experience	transformative learning *The process of critically reflecting upon previous assumptions or understandings in order to determine whether one still holds them to be true or challenges their claims (Mezirow).*	Transformative learning	Students' stories about how they experienced their learning	Upon analysis of the narrative data, five threads emerged from the interviews with the participants. 1) Stories of the multi-faceted process of learning 2) Stories of experiential learning 3) Stories of human interactions as central to defining nursing and caring 4) Stories that intertwine personal life experiences and nursing 5) Stories of transformative learning	- creating a connection between clinical experience and classroom material - utilizing peers - learning how to do things - meeting patients with their own stories - looking things up in one's books - providing end-of-life care - caring for a paediatric cancer patient and seeing graduate nurses let her do it in her own way - learning to understand the needs of patients that are unable to communicate - observing other nurses to

						determine what kind of nurse they want to be (both negatively and positively) - just spending time with patients - observing patient situations that were unjust or nursing care that was viewed as sub-optimal
Kear (2013)	Clinical experiences	transformative learning *Changes in meaning perspectives that have developed over an individual's lifetime based upon their life experiences (Mezirow, 2000).*	Transformative learning	Students' stories about how they experienced their learning	Upon analysis of the narrative data, five threads emerged from the interviews with the participants. 1) Stories of the multi-faceted process of learning 2) Stories of experiential learning 3) Stories of human interactions as central to defining nursing and caring 4) Stories that intertwine personal life experiences and nursing 5) Stories of transformative learning	- creating a connection between clinical experiences and classroom material - Interacting with others in the clinical environment - understanding patients' needs by interacting with them - observing nurses to determine what kind of nurse they want to be - providing end-of-life care
Manninen et al. (2013)	learning process in clinical practice; learning through participation and dialogue; learning in clinical practice; learning at a clinical education ward	Experiences of learning at a clinical ward	Authenticity and transformative learning	semi-structured interviews of how students experienced their encounters with others.	Two main themes: a. mutual relationship b. belongingness	- creating a relationship with patients by meeting them independently - listening and communicating with the patient/ adjust communication to the individual patient's capacity and needs - involving the patient in the nursing process by identifying the patient's own resources - Learning from making failures - handling difficult situations and feelings - collaborating with physicians, physiotherapists, other

						professionals and other students - working together with other students, discussing patient care, sharing experiences giving support, informing and showing
Manninen (2016)	Learning in clinical practice	Nursing students' learning in relation to encounters with patients, supervisors, peer students and other healthcare professionals.	transformative learning and concepts of authenticity and threshold	Semi-structured interviews and group interviews of students' experience of their learning with a focus on their encounters with others. Observations with follow up interviews about student-patient encounters and about supervision.	The results show that the core of student meaningful learning is the experience of both external and internal authenticity. External authenticity refers to being in a real clinical setting meeting real patients. Internal authenticity is about the feeling of belonging and really contributing to patients' health and well-being.	- creating mutual relationships - taking care of patients with extensive needs for nursing interventions.
Mayson and Hayward (1997)	Clinical practice experiences	Learning from hidden curriculum *Hidden curriculum involves the experience and application of theory and the wider social context relates to the practice development.*	hidden curriculum	semi-structured interviews about clinical areas and persons that have been beneficial for students' learning, as well as descriptions of their learning.	*Given a lack of a summary of important themes, I extracted these findings myself* 1. caring relationship is central for nursing; relationships with patients are significant experiences 2. Registered nurses and tutors are contributors to students' learning if they include students 3. students actively seek positive experiences 4. Peers play a significant role in learning 5. importance of being part of the ward team, facilitated by the ward	- Working in the medical/surgical areas. - Talking with/ listening to clients - helping/ making a difference for the patient - looking at positive role models - sitting together with peers/talking to peers about experiences. - watching supervisors on nursing skills and communication skills

					nurse 6. theory-practice gap	
Roberts (2008)	Clinical learning; informal on-the job learning	Peer learning *Peer learning involves students learning from each other*	No theoretical framework, used, reference to Eraut's theory on informal learning and Melia's theory of professional socialization	observation of students in clinical practice with a focus on peer interactions	Themes: a. value placed on friendships and learning in clinical practice. B. students learning survival skills (implicit and explicit rules) c. developing clinical skills	- working alongside other students. - passing along implicit rules - making mistakes/ being pulled up/called about them - sharing clinical skills - asking other students for help. - teaching other students, regardless of year of study.
Seylani et al. (2012)	Clinical experiences	Informal learning *Informal or indirect learning can occur as a function of observing, retaining, and replicating behaviours during educational experiences*	-	semi-structured interviews about what changes students experienced during their study apart from theoretical and practical knowledge.	Five categories of students' experiences: a. personal maturity and emotional growth, b. social development c. closeness to God d. alterations in value systems e. ethical and professional commitments	- Frequent personal interactions - developing relationships - frequent exposure to life and death situations - interacting with others. - caring for people with different religious beliefs - learning from patients struggling with chronic illness - continuously engaging with people who need help - seeing patients suffer - communicating with patients - caring for the most vulnerable - confronting the light and dark sides of life
Stockhausen (2005)	learning in the workplace	learning in the workplace	No theoretical framework, used, reference to Kolb's stages of experiential learning	Students' journals and reflective group debriefings comprehending reflections on clinical experiences.	Themes a. Entering the world of the patient b. Clinicians making a difference c. Constructing an identity as a nurse	- learn through the patient's experience - reacting to and deciphering emotive non-verbal cues from the patient as they care for them. - interacting with the patient - reflectively interpreting experiences with the patient.

						- sharing and developing everyday nursing practices with the RN - constructing their own schemata of admirable qualities the RN displays - picking up little tips from the RN/ little things that she does. - listening to RNs - confirming their nursing practices and assimilating theoretical and clinical knowledge - practicing skills - doing what it is it that nurses do - activities such as making a bed or showering a patient when considered from a student's achievement perspective. - Engaging with the activities of nursing - Making comparisons and discriminations of practices
Windsor (1987)	Learning in the contextual setting of clinical practice	clinical learning experience		Focused interviews about how nursing students perceive their clinical experiences.	Main categories of learning: nursing skills, time management, professional socialization. A pattern of student development through three phases	- practicing nursing skills - going back to books and journals - poring over chart for hours - consulting other health care providers - writing papers - observing nurses and participating in nursing functions - preparing for clinical practice including meeting patients, reading charts, studying patients' health needs, consulting staff. - Caring for lots of different patients with different diseases, different kinds of wards, variety of instructors, working with different equipment.

						- Working more subsequent shifts with the same patient - asking question without feeling embarrassed - asking questions to their peers

Table 2. Main concepts, operationalisations, frameworks, findings, learning activities of the included studies

Conceptualisations

Main concepts

To analyse how learning in practice was approached, we compared the main concepts of study, usually reflected in the aims of the paper. Five of the papers studied a concept that was a synonym for learning in clinical practice such as clinical learning experience or workplace learning [17 27 28 31 32]. However, in none of these studies the concept was defined or justified. The remaining eleven studies examined a specific concept related to learning in general, which was studied within the context of clinical practice. In four of the studies this concept concerned social learning, either in general, or from specific groups that are naturally present in the nursing ward [16 24 26 30]. In five of the studies, the non-conscious, unplanned nature of learning was explicitly targeted by the concepts of experiential, informal, and hidden curriculum learning[20-23 29]. The remaining studies focused on the active role of the student in learning by investigating learning styles[25], or a specific combination of both the process and effects of learning as reflected in the concept of transformative learning[18 19].

Theoretical frameworks

The five studies that used a theoretical or conceptual framework to structure the study, used Wenger's community of practice[28] or Mezirow's transformative learning theory[16-19]. Three of the studies tried to extend on existing theories using a grounded theory approach[20 21 27]. The remaining nine studies discussed their research questions and findings in the light of previous literature relevant for their specific study[22 23 31 32], some of them referring to theories about learning such as Eraut's theory of informal learning, Melia's theory of professional socialization[30], or Kolb's learning cycle[20-22 25 31].

Operationalisations

Nine studies used interviews, narratives or both to address students' experiences of learning in general[18 19 25 27-29] or specifically learning from interactions[16 17 24]. The different approaches shared a semi-structured nature, in which a few main topics were introduced by the researcher, to which students could bring up their ideas and experiences. Some authors[20-22] combined an exploration of what students understood by experiential learning, with an examination of their actual experiences in experiential learning. Finally, in three of the studies, learning was operationalised by the observation of interactions between nursing students and peers or colleagues that play a role in learning[16 26 30].

Comparison of conceptualisations and operationalisations

Most of the studies, apart from the ones that focus on social interactions, adopted a very open approach to examine learning in practice, irrespective of the concepts and theoretical frameworks

used. This resulted in a variety of overlapping outcomes. Together with the small number of studies, a thorough comparison of the suitability of different concepts was difficult. However, the overarching focus on students' personal, unplanned learning experience as a result of social interactions, suggests that the use of concepts derived from constructivist and social-cultural theories are most appropriate for studying clinical learning in nursing education.[33]

Learning activities

The thematic analysis allowed us to extract the following classes of activities that are observed or reported to contribute to learning during the daily presence of students in the nursing ward.

a. Working as a nurse
b. Interacting with ward staff
c. Interacting with peers
d. Interacting with patients
e. Processing information.

a. Working as a nurse

Students learn by actively engaging in nursing practice, including gaining responsibility for designing care plans, organising care, practicing skills and delivering patient care themselves[18 20-22 25 27 28 31], within a supportive environment[28]. Several studies explicitly report how the importance of working independently evolves throughout training [16 17 27 32]. It should be noted that this theme may overlap with the other themes, and might reflect a more general characteristic of learning in practice.

b. Interacting with ward staff

Students learn by observing both good and poor examples of registered nurses, listening to them and choosing which one could serve as a role model[18-21 23 25 28 29 31 32]. Students learn from other professionals on the ward, for example by listening to their discussions during rounds[17 25 32] or receiving feedback [28]. Beside observing nurses, students learn from sharing their work experiences with resident nurses and questioning them[25 27 31 32].

c. Interacting with peers

Students learn from peers by working together, questioning each other, sharing experiences, observing each other at work[18 22 25 26 29], and teaching each other[30]. They pass on implicit rules by asking for advice and guidance. Through discussing standards in practice, development plans and practical issues they challenge each other and expand their knowledge[26]. Through dividing the work between them, students optimise their exposure to different learning situations[26].

d. Interacting with patients

Listening to patients and building relationships is reported as an activity that students learn from[16-18 22 24 28 29]. Providing end-of-life care contributes to students' learning, [18 19 23] as well as caring for specific patient groups such as those with different religious beliefs, communication problems, extensive needs, chronic illnesses or who visibly suffer [16-18 23 25 31]. Concrete activities that are regarded to be valuable include involving the patient in the nursing process[17], assisting them with little things[28], giving medication, doing post-operative observations, and performing simple tasks such as making a bed; as long as they can be done independently[28].

e. Processing information

A final class of activities refers to how students look up, process, and store information related to patient care and their learning process. Reflecting on nursing practice promotes learning[20-22 25 31], sometimes supported by a journal or a portfolio[22]. More specifically, students reflect by analysing and comparing nursing practice and thinking how to improve it, making connections with theory and previous experience[18 19 25 27 31]. Negative experiences such as not being able to answer questions, witnessing poor practice, making mistakes, and emotion evoking encounters, stimulate students to reflect and expand their knowledge and skills[17 18 23 28 30]. Students benefit from going through textbooks[18 27 32] and patient charts[25 32], as a preparation for the work shift or for specific activities such as patient education.

Summary of results

Figure 2 summarises the findings regarding conceptualisations, operationalisations and learning activities.

Expert consultation

All four experts acknowledged the synthesised learning activities as the core of clinical training. One of them added a nuance that some activities automatically promote learning ('learning by doing'), while others require support by staff (e.g. 'peer learning'). Moreover, one of them noted that experiences may only result in learning after the learning has been made conscious. Compared to their ideal vision of practice learning, another expert missed the active role of the student in creating learning opportunities, as well as formalised elements of learning, such as the formulation of learning goals and the elaboration of theory learned in school. However, this was something they missed in their own daily practice as well. Finally, two experts noted that the 'supervisor' role of the resident nurse was referred to minimally; it appeared that resident nurses were primarily observed as role

models. Two of the experts were surprised by the notion that negative experiences are repeatedly mentioned as learning opportunities.

DISCUSSION

This study aimed to examine how different concepts equivalent to "learning in practice" are operationalised and which learning activities are reported in the nursing education literature. The final aim was to propose a terminology to guide future studies. The scoping approach allowed for identification of gaps in the current literature[7]. Five of the 17 reviewed studies adopted a general, yet unexplained, synonym for learning in practice as their object of study, the others approached learning in practice focusing on the social, unplanned, and active nature of learning. These foci are in line with the broader literature on practice learning in healthcare education[3 34]. Regardless of conceptualisations, all studies adopted a qualitative approach, resulting in various, yet overlapping themes. A closer examination of learning activities that were reported throughout the results, revealed five classes of activities that are congruent with separate bodies of literature on the importance of increasing independence[35], interaction with others[36], learning from authentic situations with patients, and reflection[37], as well as with experiences from our expert panel.

Our eventual aim was to make suggestions about the use of terminology in future research. The use of various terms for the same phenomenon may be inherent to the existence of different learning theories[34], that each lack explanatory power to inform all aspects of clinical education[38]. Unfortunately, as the poor alignment within most studies resulted in similar operationalisations and results irrespective of the concepts used, specific recommendations about how to use these concepts are hard to make on the basis of the current literature. Yet, when considering overarching trends, all concepts and learning activities in the current body of research fit well into a constructivist approach to learning, and more specifically experiential learning theories[34]. Building on educational theorists like Piaget and Dewey[33], experiential learning theories cover both cognitive and sociocultural approaches to learning[34], sharing the idea that learning evolves from doing, in an individual trajectory that is not predefined, in constant interaction with others, in which reflection and the interaction between theory and practice are central[3 34]. Although some of the studies in the current research did use experiential theories or referred to them[20-22 25 31], a more systematic and justified use of these theories and underlying concepts to frame and interpret research, would benefit future research. For instance, as was commented by one of the experts we consulted, the interactions between behaviour and cognitive processing were underexposed in the current literature. Cognitive approaches of experiential learning building on the work of Kolb[39] could offer

useful models to study and interpret these interactions. Given the body of work on experiential learning theories including their application in different stages of (medical) education, further elaboration on these theories can add to our understanding of learning and can help design and evaluate learning interventions in and outside the ward[40 41].

Although some studies demonstrated how students actively interact with their environment by discussing inconsistencies, asking questions, and reflecting on undesirable role models, few of them offered examples of students actively creating learning opportunities or negotiating what and how to learn. This is in line with literature showing that students often focus on task completion and fitting into the team at the expense of deepening, broadening and self-regulating their learning[42 43 44]. Future studies should continue to address both individual and environmental factors that affect students' ability to actively and critically navigate through their clinical placements. In line with our previous recommendations, approaching clinical learning as 'experiential learning', may help seeing it as a pathway for personal development rather than getting students adapted to the current work in the ward[45]. A next step would be to identify individual preferences and behaviours in appreciating learning opportunities. Caution has to be taken though in labels such as 'learning styles' as one of the studies[25] did, in the absence of an accurate description of how this has been interpreted.

Not surprisingly, there were frequent references to the informal or hidden nature of clinical learning. As this learning occurs partly unconsciously, it is a challenging subject to define and study[46]. In the reviewed studies, informal learning was addressed by what it is *not* (i.e. theoretical and practical knowledge), and hidden curriculum was described by learning resources that were *not* reported by participants[47]. Formal or formalised activities in the clinical area (such as peer teaching and doing 'clinical homework'), were not labelled as such. As both formal and informal learning coexist in the practice setting and the dichotomy between the two has been questioned[48], clear definitions of these concepts are required, with which the different activities that student engage in throughout the day can be classified.

In most of the studies, potential or desirable learning outcomes were not articulated, and were not separated from outcomes such as professional identity formation or wellbeing. Studies that did include the intended effect of learning in their definitions, as those of Kear [18 19], did not critically revisit if these outcomes were indeed reported. The lack of predefined outcomes in clinical learning[49] and the scope of this review excluding articles confined to skills performance[50] or assessment[51], might explain why learning outcomes received relatively little attention in the reviewed studies. However, critically discussing the learning process in relation to actual and desirable outcomes, with

reference to the body of literature on this topic, would improve our understanding of clinical learning.

In this review, clinical learning has been studied from the viewpoint of the student as a learner, as opposed to the perspective of external factors affecting students' learning. However, as both this review and previous literature have demonstrated[2], learning is a social process that is highly dependent on the environment. If students feel supported by the team they will be more willing to take responsibility and actively create learning opportunities[43 52]. The current work adds to our understanding of the student's role within the complex structure of clinical nursing education and can be a starting point for future research on how individual interactions between students and their environment promote learning.

Limitations

The variety of concepts, processes, definitions and outcomes associated with learning in clinical practice proved challenging in determining the boundaries of our search. The selection was influenced by choice of terminology and framing by the authors of the studies. This review therefore provides insight into the current use of terminology as well as caveats in applying it. Limiting to nursing in the hospital setting excluded us from both theoretical and experimental research on practice learning in other health professions. However, this focus enabled us to synthesise specific findings from the different studies. The approach can be of interest for other health professions, and will eventually allow for comparison of the literature. Finally, our synthesis of learning activities is based on studies with heterogeneity in populations, setting, and year of publication, in which the same type of activity might have a different meaning. As we reinterpreted some of the data, caution has to be taken in drawing firm conclusions[53]. Nevertheless, as the findings were recognised by experts and correspond with existing literature, the categories found are a good starting point for further study.

Conclusion

This review provides an overview of how learning in clinical practice has been addressed in the undergraduate nursing education literature and which learning activities are reported. The studies share a constructivist approach to learning, but offer little guidance for the use of specific terminology in future studies due to a lack of alignment within the studies. Studies consistently reveal the importance of working independently, learning from peers, professionals and patients, and the cognitive appraisal of learning. Both the approaches and reported learning activities fit well into experiential learning theories. There is still uncertainty about formal and informal components

of learning and how they should be studied, as well as about desirable outcomes of clinical learning and how to incorporate them in research. Given the importance of students' active engagement in learning as well as their reflection on it, behavioural and cognitive aspects of learning as well as their interactions should be explicitly addressed.

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FUNDING

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

COMPETING INTERESTS

The authors declare that they have no competing interests.

CONTRIBUTORS

MS, RAK, HED, SP, JCFK contributed to the research idea and study design and edited and revised the paper. MS and JCFK developed the search strategy and executed the search. MS and RAK identified and agreed eligible papers and extracted the data. MS wrote the manuscript. RAK led the supervision of the project.

PATIENT CONSENT

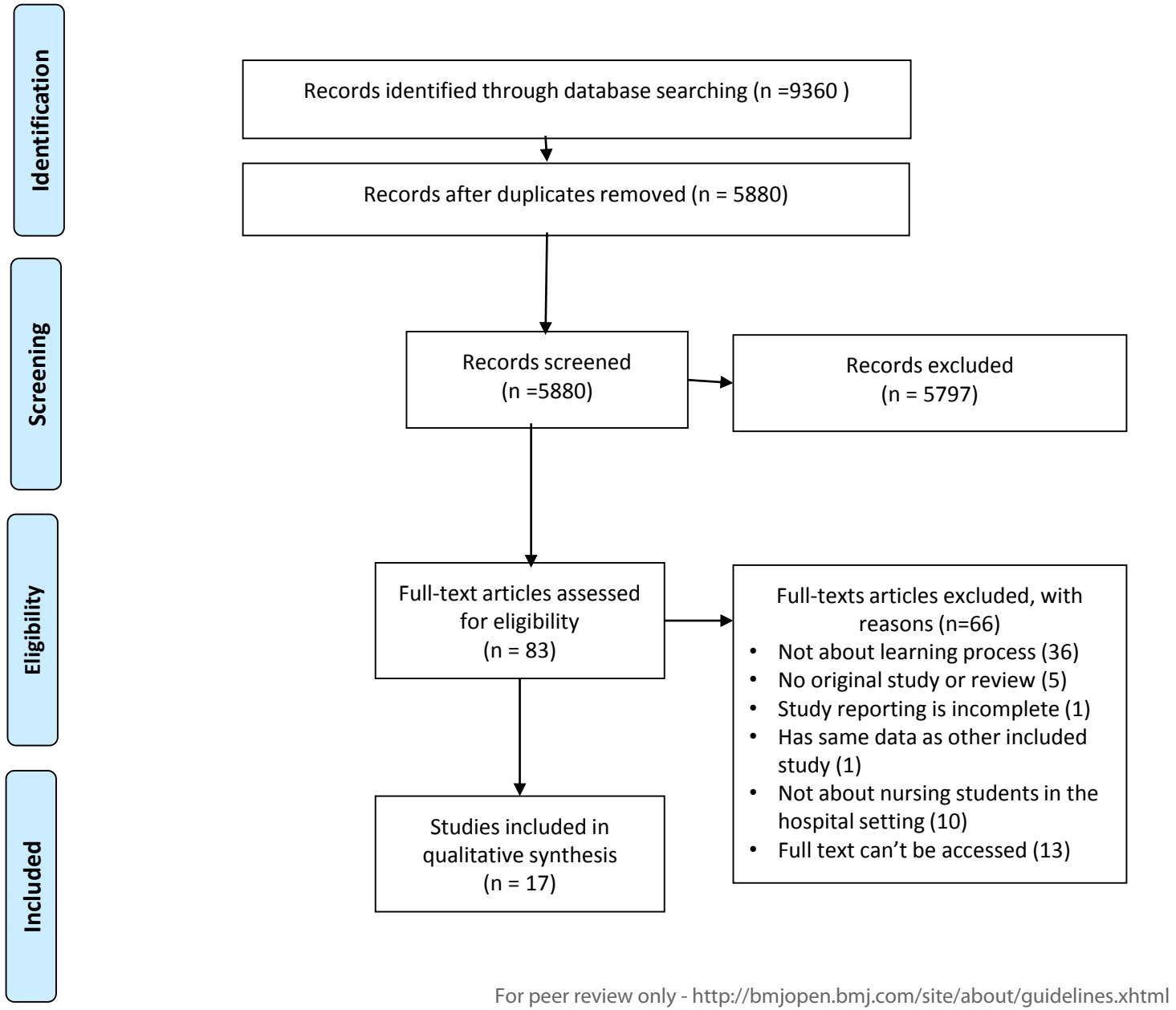
Not required.

DATA SHARING STATEMENT

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

FIGURES

Figure 1. Flow diagram article screening and selection search step 2


Identification
Screening
Eligibility
Included
Records identified through database searching (n =9360)
Records after duplicates removed (n = 5880)
Records screened
(n =5880)
Records excluded
(n = 5797)
Full-text articles assessed
for eligibility
(n = 83)
Full-texts articles excluded, with reasons (n=66)
• Not about learning process (36)
• No original study or review (5)
• Study reporting is incomplete (1)
• Has same data as other included study (1)
• Not about nursing students in the hospital setting (10)
• Full text can't be accessed (13)
Studies included in
qualitative synthesis
(n = 17)

LEARNING ACTIVITIES				
Working as a nurse	Interacting with ward staff	Interacting with peers	Interacting with patients	Processing information

OPERATIONALISATIONS			
Interviews/narratives of students' experiences with learning in practice	Interviews/narratives of students' experiences of learning in practice focused on interactions	Observations of interactions involved in learning	Interviews about students' understanding of a specific concept

CONCEPTUALISATIONS			
Concepts synonym for practice learning	Concepts concerning social learning	Concepts appreciating the unconscious, unplanned nature of clinical learning	Concepts appreciating the active role of students
• *Clinical learning experience* • *Workplace learning* • *Clinical learning* • *Learning in the clinical workplace* • *Experiences of learning at a clinical ward* • *Learning in the workplace*	• *Peer learning* • *Peer assisted learning* • *Learning from patient stories* • *Learning in relation to encounters with others*	• *Experiential learnig* • *Informal learning* • *Learning from the hidden curriculum* • *Informal on the job learning*	• *Learning styles in the clinical setting* • *Transformative learning*

PRISMA-ScR Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable) background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions or objectives lend themselves to a scoping review approach.	3
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (for example, population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions or objectives.	3
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (for example, a Web address); and if available, provide registration information, including the registration number.	4
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (for example, years considered, language, and publication status), and provide a rationale.	5
Information sources	7	Describe all information sources in the search (for example, databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	4 + supplementary file 3
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Supplementary file 3
Selection of sources of evidence	9	State the process for selecting sources of evidence (that is, screening and eligibility) included in the scoping review.	5
Data charting process	10	Describe the methods of charting data from the included sources of evidence (for example, calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	6
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	6
Critical Appraisal of Individual Sources of Evidence	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	6
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	N/A
Synthesis of results	14	Describe the methods of handling and summarizing the data that were charted.	6

PRISMA-ScR Checklist

Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	N/A
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	N/A
RESULTS			
Selection of Sources of Evidence	17	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	7
Characteristics of Sources of Evidence	18	For each source of evidence, present characteristics for which data were charted and provide the citations.	7
Critical Appraisal Within Sources of Evidence	19	If done, present data on critical appraisal of included sources of evidence (see item 12).	7-8
Results of Individual Sources of Evidence	20	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	9-18
Synthesis of results	21	Summarize or present the charting results as they relate to the review questions and objectives.	19-21
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	N/A
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	N/A
DISCUSSION			
Summary of evidence	24	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	22
Limitations	25	Discuss the limitations of the scoping review process.	23
Conclusions	26	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications or next steps.	24
FUNDING			
Funding	27	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	26

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, Moher D, Peters MDJ, Horsley T, Weeks L, Hempel S, Akl EA, Chang C, McGowan J, Stewart L, Hartling L, Aldcroft A, Wilson MG, Garritty C, Lewin S, Godfrey CM, Macdonald MT, Langlois EV, Soares-Weiser K, Moriarty J, Clifford T, Tunçalp Ö, Straus SE. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Ann Intern Med. 2018.

Protocol for a scoping review on the conceptualization of learning in undergraduate clinical nursing practice

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Word count

2385

Key words

Undergraduate nursing education, learning in practice

ABSTRACT

Introduction: Learning in the clinical setting is a major form of learning in undergraduate nursing education. In spite of this, how nursing students learn in clinical practice is still largely unknown. Moreover, there is no conceptual clarity on learning in practice in the current literature. This paper aims to set up a protocol for a scoping review of the literature in order to map different conceptualizations of learning in undergraduate clinical nursing practice in the hospital setting. The operationalisations of different concepts will be compared and the findings of the studies will be synthesized.

Methods and analysis: This scoping review will be guided by the methodological framework proposed by Arksey and O'Malley and refined by Levac et al. and the Joanna Briggs institute. The search strategy will be developed together with a medical information specialist and the search will be performed in electronic databases (PubMed, EBSCO/ERIC and EBSCO/CINAHL). In a first search, we will identify concepts that are used as an equivalent to learning in practice. Next we will search for studies operationalizing these concepts in undergraduate nursing education. Finally, we will check reference lists for additional publications. Abstracts and full-text studies will independently be screened by two researchers. All studies that have 'learning in undergraduate clinical nursing practice' as their main topic and that include a definition of operationalization of an equivalent to learning in clinical practice, will be considered for inclusion. We will chart different conceptualisations and their theoretical underpinnings, as well as reported learning opportunities, informal and formal aspects of learning, social aspects of learning and gaps in the literature.

Ethics and dissemination: This review will help design future studies on learning in clinical nursing practice using well-defined and agreed upon terminology. The results will be disseminated through journal publications and conference presentations.

ARTICLE SUMMARY

Strengths and limitations of this study

- This protocol outlines a rigorous design that includes an established research framework, a search strategy and a selection process.
- The search strategy includes different databases with peer-reviewed literature, with no restrictions to the study design or the publication date.
- The assessment of the quality of the included papers will enable identifying gaps in the literature.

- A limitation is that the literature search will only cover undergraduate nursing education, while a comparison with literature on learning in practice in other health professions would enrichen our understanding of potential conceptualizations.
- This study will not include books or grey literature, which will allow us to map how learning in practice is conceptualized in original research.

INTRODUCTION

Learning in the clinical setting is crucial for becoming a competent nurse[1]. However, how nursing students learn in clinical practice is still largely unknown. A vast body of knowledge exists on factors that influence learning, but the process itself remains underexposed [4]. For example, there is a lack of insight into how individual learning outcomes can be predicted, or which learning opportunities best promote students' learning [5]. Understanding learning in the clinical setting can help design, supervise and evaluate individual learning trajectories and their outcomes in practice. This study aims to set up a protocol for a scoping review to examine how different concepts that are equivalent to 'learning in practice' are used and operationalized in the literature, and what these studies add to our understanding of learning in the clinical setting

In the educational literature, the concept of 'learning in practice' has been widely studied in the context of workplace learning by professionals [6] or practice learning by students[7]. However, there is no unified definition or approach towards this concept[8]. Two main characteristics of clinical learning can be clearly distinguished in the literature. First, learning in practice is often distinguished from learning in the classroom setting as informal opposed to formal learning, where informal learning arises in situations where learning is not the primary aim[9]. However, some authors question the validity of a dichotomy between formal and informal learning[10], and state that every learning situation contains both formal and informal elements[11]. This would particularly apply to clinical learning, which is characterized by a constant interplay of the 'reality' of clinical practice and formal learning interventions such as feedback and assessment[12]. Another essential characteristic of workplace learning is its social rather than individual nature[13]. That is, learning occurs in interaction and dialogue with others [9].

In the nursing education literature, just as in other health professions education literature, different terms are used to describe and study learning in clinical practice, with different theoretical underpinnings. Moreover, the rationale behind the application of the concepts used is not always explained. Therefore, it is not always clear whether these different terms refer to the same concept, and how they are defined in terms of learning content (skills, knowledge, values), process (implicit,

explicit), control (intended or unintended, guided or not guided) and learning outcomes. Also, different researchers appear to apply the same concept differently. Having clear and agreed upon terminology can help design future studies that can contribute to understanding learning in clinical practice along with its limitations so that nursing wards can be organized for optimal benefit of the students.

The goal of this scoping review is to provide guidance for the use of concepts that describe learning in undergraduate clinical nursing practice in future studies. This study therefore aims to examine how different concepts that are equivalent to 'learning in practice' are used and operationalized in the literature. Therefore, we will look for studies that examine how learning in the clinical setting takes place. To enable comparison of the use of different concepts, we will focus on the general hospital setting. This context is the traditional setting for nursing training and comprises a variety of factors that may be relevant for learning, such as the presence of registered nurses, peers, and other professionals, as well as complex and acute patients, thereby offering a wide array of multidimensional learning opportunities [14]. We will particularly consider how formal and informal aspects of learning, as well as the social component of learning are included in these operationalisations. We will synthesize the results relating to how students learn in clinical practice.

A body of work on concepts to describe learning in practice does exist outside nursing education literature[15]. To our knowledge, the only study that included distinct concepts of learning in clinical practice in a review before, was a concept analysis of work-based learning in health care education by Manley, et al. [16]. The authors identified common attributes, enabling factors and consequences of workplace learning and proposed a definition. The current review will build on this work by closely examining different concepts of learning in practice in the context of undergraduate nursing education, as well as comparing how they are used to study clinical learning. This will enable us to address gaps in the literature as well as make suggestions for the use of terminology in future studies Also, the current study will include literature after 2009 when Manley, et al. [16] conducted their study. In interpreting our findings, we will consider the broader body of literature on learning in practice.

METHODS AND ANALYSIS

We decided to use the scoping review approach to map the different concepts that are used to study learning in clinical nursing practice as well as the way they are operationalised and the information they provide about how students learn in the clinical setting. Since the lack of a focused line of inquiry requires a broad research question, we consider a scoping review to be more appropriate than a systematic review. Scoping can help understand complex concepts through clarifying

definitions and conceptual boundaries[17]. Scoping will also enable us to identify key concepts, gaps in the literature, and types and sources of evidence to inform practice, policymaking, and research[18]. To get a comprehensive picture of the existing research, we will include studies with different designs. Since scoping reviews are hypothesis-generating rather than hypothesis-testing, this review can provide a stepping off point for further research.

Standardized reporting guidelines can help the critical appraisal of reviews and thereby increase their reproducibility, completeness, and transparency[19]. For systematic reviews, the PRISMA-P checklist has been developed to facilitate the preparation of a robust research protocol[20]. PRISMA guidelines for scoping reviews are still under development[21]. We therefore used relevant items of the PRISMA-P (Preferred Reporting Items for Systematic Reviews and Meta-analysis Protocols) to draft this protocol, as outlined in additional file 1.

To ensure rigor in reporting the methodology, we will use the six-stage approach developed by Arksey and O'Malley [22] and refined by Levac, et al. [23] and the Joanna Briggs institute [24] (1) identifying the research question; (2) identifying relevant studies; (3) selecting studies; (4) charting the data; (5) collating, summarizing and reporting the results; (6) expert consultation (optional and included).

Stage 1. Identifying the research question

Since our aim is to understand how learning in undergraduate clinical nursing practice is conceptualized in the current literature irrespective of research design and outcome, our research question is:

- How are different concepts that are used as an equivalent to learning in the hospital setting operationalized in the undergraduate nursing education literature?

As scoping is an iterative process [22], we might add additional questions based on our findings along the review process. While the eventual goal of this study is to contribute to the understanding of the process of nursing students' learning in practice, we will also synthesize results that are relevant to this topic.

Stage 2. Identify relevant studies

The search strategy will be iteratively developed by the research team. As suggested by the Joanna Briggs institute [24],we will start with a very broad search to inform our subsequent search strategy. A comprehensive search strategy will be developed (by MS and JCFK) to conduct this stepwise search

process following the Peer Review of Electronic Search Strategies (PRESS) 2015 guideline statement [25].

In an initial search (search step 1), we will combine the terms 'learning in clinical practice' and 'undergraduate nursing students'. The search query for both steps will first be developed for PubMed and later extended to EBSCO/ERIC and EBSCO/CINAHL to identify different concepts in the literature that are used as an equivalent to 'learning in clinical practice' by nursing students. See our draft search in the additional file 2 for step 1 of our search. The first 100 search results from each database will be reviewed by the researchers to assess validity of the search strategy. When agreement has been reached about the initial search strategy, the first 200 abstracts will be scanned by the two reviewers (MS and RAK) on concepts potentially eligible for inclusion in the second search step. Eligible concepts are concepts that describe the process of learning to become a nurse within the clinical context ('such as 'experiential learning' or 'informal learning'), rather than specific aspects or (such as 'skill acquisition' or 'peer learning'). In case of full agreement between the two reviewers on potentially eligible concepts, the first reviewer will screen the rest of the abstracts. In case of disagreement, the second author will scan another 200 abstracts until full agreement is reached. After all abstracts have been screened, the two reviewers will discuss all potentially eligible concepts and select concepts to be included in the second search step.

After having selected the different concepts, we will develop a search query (search step 2) in PubMed and subsequently extend to EBSCO/ERIC and EBSCO/CINAHL combining each of the identified concepts with 'undergraduate nursing' to find studies operationalizing one of the identified concepts in the literature on nursing students' learning in the hospital setting.

After these two searches, we will check reference lists for additional publications (See figure 1 for a flow diagram of the search and selection process). We will conduct the two searches in June 2018.

Stage 3. Study selection

Following the second step of our search strategy, two independent researchers will screen abstracts and assess the eligibility for full text retrieval. Selected full-text studies will again be compared between the reviewers with disagreement being resolved through discussion and consensus and with input from the full research team.

The inclusion criteria will be developed in an iterative process in which the reviewers calibrate a threshold for inclusion and exclusion. The initial inclusion criteria will be:

- Original research or reviews in peer reviewed journals that have learning in undergraduate clinical nursing practice in the hospital setting as one of their main topics, regardless of publication date and type of article.
- Studies that examine how students learn in the clinical hospital setting

Since we are interested in how learning in practice is operationalized in peer-reviewed research, we exclude books, book reviews, commentaries, letters to the editor, PhD theses, and reports. Reasons for exclusion will be documented at the full-text review stage.

Stage 4. Charting the data

Data will be extracted from full-text journal articles which meet the aforementioned inclusion criteria. A draft analytic frame is developed to document selected studies into an excel spreadsheet, including study characteristics (year, country, methodology, study question, study design, participants, outcomes, study quality), conceptualization of learning in practice (definitions, theoretical underpinnings/rationale, operationalisations, formal/informal aspects of learning, social interactions, learning opportunities)and reported gaps in the literature. Other categories that come during the data extraction progress will be discussed in the research team and added to the data extraction form. Although formal assessment of study quality is generally not performed in scoping reviews [24], some claim it should be incorporated in the methodology [18]. Assessing study quality will enable us to address not only quantitative, but also qualitative gaps in the literature[23]. We will therefore assess the quality of included studies by a set of quality indicators for reviews developed by Buckley, et al. [26].The form will be piloted on 5–10 articles by the team and will allow us to analyse the selected articles through a common framework.

We will document studies that are not selected for full text retrieval in a separate file. To ensure accurate data collection, each reviewer's independent charted data will be compared and any discrepancies will be iteratively discussed by the researchers to ensure consistency between the reviewers.

Stage 5. Collating, summarizing and reporting results

A PRISMA flow diagram will be used to report final numbers in the resulting study publication. As we expect a diverse body of knowledge, we will give a descriptive account of concepts and subsequent operationalizations. We will synthesise study findings using narrative descriptions based on themes that emerge from the extracted data. The results will be compared and consolidated through consensus between two of the r MS and RAK.

We will address both quantitative and qualitative gaps in the literature. We will discuss the data in the light of relevant theories on workplace learning both in and outside nursing education literature and make suggestions for the operationalization of learning in practice for future studies.

Stage 6. Expert consultation

In order to confirm our findings and interpretations, two nurse educators, with experience in scientific research and expertise on learning in clinical practice, will be approached for consultation.

ETHICS AND DISSEMINATION

This scoping review will be the first study to compare terminology used for learning in undergraduate nursing clinical practice and thereby will contribute to the design and comparison of future studies in this field. This protocol reports a comprehensive, rigorous and transparent methodology. The results will be disseminated through a peer-reviewed publication and national and international conferences such as the AMEE (Association of Medical Education in Europe) conference, targeting an audience involved in undergraduate nursing education. By identifying gaps in the current body of literature, this study can guide future nursing education research. Both the methodology and the results may be of interest for researchers and educators in other health professions than nursing, given the widely spread importance of learning in clinical practice. Since the methodology applied consists of reviewing and collecting data from publicly available materials, this study does not require an ethical approval.

PATIENT AND PUBLIC INVOLVEMENT

- *How was the development of the research question and outcome measures informed by patients' priorities, experience, and preferences?* As education is essential for improving patient care, patients will eventually benefit from the body of knowledge this study contributes to. However, specific interests of patients have not been examined.
- *How did you involve patients in the design of this study?* Patients have not been involved in the study.
- *Were patients involved in the recruitment to and conduct of the study?* No.
  How will the results be disseminated to study participants? As this concerns a review, this study has no participants.
- *For randomised controlled trials, was the burden of the intervention assessed by patients themselves?* Not applicable
- *Patient advisers should also be thanked in the contributorship statement/acknowledgements.* Not applicable
- *If patients and or public were not involved please state this.* Not applicable

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AUTHOR STATEMENT

MS and RAK were responsible for the initial design of this study MS, HED, RAK, SP, JCFK, contributed to the development of the eligibility and data extraction criteria JCFK, MS, HED, RAK, developed and executed the search strategy. MS and RAK are responsible for abstract and full-text screening. MS conceptualized the review approach and led the writing of the manuscript. MS, RAK, HED, SP, JCFK contributed and approved the final version of this protocol. RAK led the supervision of the manuscript preparation.

FUNDING

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

CONFLICT OF INTERESTS

The authors declare that they have no competing interests.

Supplementary file 3. Draft search strategy step 1 and 2

1. **Search strategy step 1**

PubMed (9 May 2018)

Search	Query	Items found
#1	"Students, Nursing"[Mesh] OR "Internship, Nonmedical"[Mesh:noexp] OR (nursing[tiab] AND student*[tiab]) OR ((nursing[tiab] OR nurse[tiab] OR nurses[tiab]) AND internship*[tiab])) AND ((("Clinical Competence"[Mesh] OR "Clinical Medicine"[Majr] OR clinical*[ti] OR clinical*[ot] OR practice*[ti] OR practice[ot]) AND ("Learning"[Mesh] OR learning*[tiab])) OR clinical learning*[tiab]	**3,586**

Ebsco/ERIC (9 May 2018)

Search	Query	Items found
S7	S1 AND S6	**408**
S6	S4 OR S5	**70,505**
S5	TI ("clinical learning*") OR AB ("clinical learning*")	**84**
S4	S2 AND S3	**70,505**
S3	DE "Learning" OR DE "Active Learning" OR DE "Adult Learning" OR DE "Associative Learning" OR DE "Aural Learning" OR DE "Cooperative Learning" OR DE "Discovery Learning" OR DE "Discrimination Learning" OR DE "Electronic Learning" OR DE "Experiential Learning" OR DE "Incidental Learning" OR DE "Intentional Learning" OR DE "Interference (Learning)" OR DE "Lifelong Learning" OR DE "Mastery Learning" OR DE "Multisensory Learning" OR DE "Nonverbal Learning" OR DE "Observational Learning" OR DE "Prior Learning" OR DE "Problem Based Learning" OR DE "Rote Learning" OR DE "Second Language Learning" OR DE "Sequential Learning" OR DE "Serial Learning" OR DE "Student Centered Learning" OR DE "Symbolic Learning" OR DE "Transfer of Training" OR DE "Transformative Learning" OR DE "Verbal Learning" OR DE "Visual Learning" OR DE "Workplace Learning" OR DE "Active Learning" OR DE "Adult Learning" OR DE "Associative Learning" OR DE "Paired Associate Learning" OR DE "Aural Learning" OR DE "Cooperative Learning" OR DE "Discovery Learning" OR DE "Discrimination Learning" OR DE "Electronic Learning" OR DE "Experiential Learning" OR DE "Field Experience Programs" OR DE "Internship Programs" OR DE "Job Shadowing" OR DE "Service Learning" OR DE "Incidental Learning" OR DE "Intentional Learning" OR DE "Interference (Learning)" OR DE "Lifelong Learning" OR DE "Mastery Learning" OR DE "Multisensory Learning" OR DE "Nonverbal Learning" OR DE "Perceptual Motor Learning" OR DE "Observational Learning" OR DE "Prior Learning" OR DE "Problem Based Learning" OR DE "Rote Learning" OR DE "Second Language Learning" OR DE "Sequential Learning" OR DE "Serial Learning" OR DE "Student Centered Learning" OR DE "Symbolic Learning" OR DE "Transfer of Training" OR DE "Transformative Learning" OR DE "Verbal Learning" OR DE "Visual Learning" OR DE "Workplace Learning" OR TI (learning*) OR AB (learning*)	**381,995**
S2	DE "Clinical Experience" OR TI (clinical* OR practice*) OR AB (clinical* OR practice*)	**205,148**

S1	DE "Nursing Students" OR TI ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*)) OR AB ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*))	**2,294**

Ebsco/CINAHL (9 May 2018)

Search	Query	Items found
S11	S1 AND S10	**3,209**
S10	S5 OR S9	**14,430**
S9	S3 AND S8	**12,924**
S8	MH "Clinical Competence+" OR TI (clinical* OR practice*)	**234,601**
S7	S1 AND S6	**5,669**
S6	S4 OR S5	**32,948**
S5	MH "Learning Environment, Clinical" OR TI ("clinical learning*") OR AB ("clinical learning*")	**2,388**
S4	S2 AND S3	**31,869**
S3	MH "Learning+" OR MH "Conditioning (Psychology)+" OR MH "Memory+" OR MH "Reinforcement (Psychology)+" OR MH "Problem Solving+" OR TI (learning*) OR AB (learning*)	**103,547**
S2	MH "Clinical Competence+" OR TI (clinical* OR practice*) OR AB (clinical* OR practice*)	**631,184**
S1	MH "Students, Nursing+" OR MH "Students, Nursing, Baccalaureate+" OR MH "Students, Nursing, Graduate+" OR TI ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*)) OR AB ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*))	**35,637**

2. **Search strategy and numbers of hits step 2**

2.1 search strategy

(***PubMed:*** *(concept*[tiab] OR (conceptpart1*[ti] AND conceptpart2*[ti]) OR (conceptpart1 [ot] AND conceptpart2*[ot])) If integral concept could not be found in the Index, this was composed with an AND relation.*

[Mesh] = Medical Subject Headings, keywords in PubMed
[tiab] = words in title or abstract
[ti] = words in title
[ot] = other terms, in particular author keywords
MH = mapped heading, keyword in CINAHL
DE = descriptor, keyword in ERIC

TI = words in title
AB = words in abstract

Search	PubMed	Ebsco/ERIC	Ebsco/CINAHL
#1	"Students, Nursing"[Mesh] OR "Internship, Nonmedical"[Mesh:noexp] OR ((nursing[tiab] OR nurse[tiab] OR nurses[tiab]) AND student*[tiab]) OR ((nursing[tiab] OR nurse[tiab] OR nurses[tiab]) AND internship*[tiab])	DE "Nursing Students" OR TI ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*)) OR AB ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*))	MH "Students, Nursing+" OR MH "Students, Nursing, Baccalaureate+" OR MH "Students, Nursing, Graduate+" OR TI ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*)) OR AB ((nursing N3 student*) OR ((nursing OR nurse OR nurses) N3 internship*))
#2	authentic learning*[tiab] OR (authentic*[ti] AND learning*[ti]) OR (authentic*[ot] AND learning*[ot])	TI (authentic* AND learning*) OR AB ("authentic learning*")	TI (authentic* AND learning*) OR AB ("authentic learning*")
#3	clinical learning*[tiab]	TI ("clinical learning*") OR AB ("clinical learning*")	TI (authentic* AND learning*) OR AB ("authentic learning*")
#4	clinical placement learning*[tiab] OR (clinical placement*[ti] AND learning*[ti]) OR (clinical placement*[ot] AND learning*[ot])	TI ("clinical placement"* AND learning*) OR AB ("clinical placement learning*")	TI ("clinical placement"* AND learning*) OR AB ("clinical placement learning*")
#5	(clinically based*[tiab] AND learning*[tiab])	TI ("clinically based" AND learning*) OR AB ("clinically based learning*")	TI ("clinically based" AND learning*) OR AB ("clinically based learning*")
#6	(experiential learning*[tiab] OR (experiential*[ti] AND learning*[ti]) OR (experiential*[ot] AND learning*[ot]))	DE "experiential learning" OR TI (experiential* AND learning*) OR AB ("experiential learning*")	MH "Experiential learning" OR TI (experiential* AND learning*) OR AB ("experiential learning*")
#7	experimental learning*[tiab] OR (experimental*[ti] AND learning*[ti]) OR (experimental*[ot] AND learning*[ot])	TI (experimental* AND learning*) OR AB ("experimental learning*")	TI (experimental* AND learning*) OR AB ("experimental learning*")
#8	hidden curriculum*[tiab] OR (hidden*[ti] AND curriculum*[ti]) OR (hidden*[ot] AND curriculum*[ot])	DE "hidden curriculum" OR TI (hidden* AND curriculum*) OR AB ("hidden curriculum*")	TI (hidden* AND curriculum*) OR AB ("hidden curriculum*")
#9	informal learning*[tiab] OR (informal*[ti] AND learning*[ti]) OR (informal*[ot] AND learning*[ot])	TI (informal* AND learning*) OR AB ("informal learning*")	TI (informal* AND learning*) OR AB ("informal learning*")
#10	learning by doing*[tiab] OR (learning*[ti] AND doing*[ti]) OR (learning*[ot] AND doing*[ot])	TI (learning* AND doing*) OR AB ("learning by doing*")	TI (learning* AND doing*) OR AB ("learning by doing*")

#11	"learning from experience*"[tiab]	TI "learning w1 experience*" OR AB "learning w1 experience*"	TI "learning w1 experience*" OR AB "learning w1 experience*"
#12	"learning through experience*"[tiab]	TI ("learning through experience*") OR AB ("learning through experience*")	TI ("learning through experience*") OR AB ("learning through experience*")
#13	(learning*[tiab] AND clinical placement experience*[tiab])	TI (learning* AND "clinical placement experience") OR AB ("learning from clinical placement experience*")	TI (learning* AND "clinical placement experience") OR AB ("learning from clinical placement experience*")
#14	practice based learning*[tiab] OR (practice based*[ti] AND learning*[ti]) OR (practice based*[ot] AND learning*[ot])	TI ("practice based*" AND learning*) OR AB ("practice based learning*")	TI ("practice based*" AND learning*) OR AB ("practice based learning*")
#15	practice learning*[tiab]	TI ("practice learning*") OR AB ("practice learning*")	TI ("practice learning*") OR AB ("practice learning*")
#16	learning from practice*[tiab]	TI (learning w1 practice*) OR AB (learning w1 practice*)	TI (learning w1 practice*) OR AB (learning w1 practice*)
#17	learning in practice*[tiab]	TI (learning w1 practice*) OR AB (learning w1 practice*)	TI (learning w1 practice*) OR AB (learning w1 practice*)
#18	(learning*[tiab] AND clinical practicum*[tiab])	TI (learning* AND "clinical practicum*") OR AB (learning w2 clinical practicum*)	TI (learning* AND "clinical practicum*") OR AB (learning w2 clinical practicum*)
#19	(learning*[tiab] AND clinical field*[tiab])	TI (learning* AND "clinical field*") OR AB (learning w2 clinical field*)	TI (learning* AND "clinical field*") OR AB (learning w2 clinical field*)
#20	(learning*[tiab] AND clinical context*[tiab])	TI (learning* AND "clinical context*") OR AB (learning w2 clinical context*)	TI (learning* AND "clinical context*") OR AB (learning w2 clinical context*)
#21	(learning*[tiab] AND clinical setting*[tiab])	TI (learning* AND "clinical setting*") OR AB (learning w2 clinical setting*)	TI (learning* AND "clinical setting*") OR AB (learning w2 clinical setting*)
#22	(learning*[tiab] AND clinical nursing environment*[tiab])	TI (learning* AND "clinical nursing environment*") OR AB (learning w2 clinical nursing environment*)	TI (learning* AND "clinical nursing environment*") OR AB (learning w2 clinical nursing environment*)
#23	(learning*[tiab] AND clinical environment*[tiab])	TI (learning* AND "clinical environment*") OR AB (learning w2 clinical environment*)	TI (learning* AND "clinical environment*") OR AB (learning w2 clinical environment*)
#24	learning on the job*[tiab] OR (learning*[ti] AND on the job*[ti]) OR (learning*[ot] AND on the job*[ot])	TI (learning* AND "on the job*") OR AB ("learning on the job*")	TI (learning* AND "on the job*") OR AB ("learning on the job*")
#25	workplace learning*[tiab] OR (workplace*[ti] AND learning*[ti]) OR (workplace*[ot] AND learning*[ot])	DE "workplace learning" OR TI (workplace* AND learning*) OR AB ("workplace learning*")	TI (workplace* AND learning*) OR AB ("workplace learning*")

#26	learning in the workplace*[tiab] OR (learning*[ti] AND workplace*[ti]) OR (learning*[ot] AND workplace*[ot])	TI (learning* AND "in the workplace*") OR AB ("learning in the workplace*")	TI (learning* AND "in the workplace*") OR AB ("learning in the workplace*")
#27	work based learning*[tiab] OR (work based*[ti] AND learning*[ti]) OR (work based*[ot] AND learning*[ot])	TI ("work based*" AND learning*) OR AB ("work based learning*")	TI ("work based*" AND learning*) OR AB ("work based learning*")
#28	work integrated learning*[tiab] OR (work integrated*[ti] AND learning*[ti]) OR (work integrated*[ot] AND learning*[ot])	TI ("work integrated*" AND learning*) OR AB ("work integrated learning*")	TI ("work integrated*" AND learning*) OR AB ("work integrated learning*")
#29	learning process*[tiab]	DE "Learning Processes" OR TI ("learning process*") OR AB ("learning process*")	TI ("learning process*") OR AB ("learning process*")
#30	"learning the practice of nursing"[tiab]	TI ("learning the practice of nursing*") OR AB ("learning the practice of nursing*")	TI ("learning the practice of nursing*") OR AB ("learning the practice of nursing*")
#31	(learning*[tiab] AND clinical nursing*[tiab])	TI (learning* AND "clinical nursing"*) OR AB ("learning clinical nursing*")	TI (learning* AND "clinical nursing"*) OR AB ("learning clinical nursing*")
#32	placement learning*[tiab] OR (placement*[ti] AND learning*[ti]) OR (placement*[ot] AND learning*[ot])	TI (placement* AND learning*) OR AB ("placement learning*")	TI (placement* AND learning*) OR AB ("placement learning*")
#33	"Self-Directed Learning as Topic"[Mesh] OR self directed learning*[tiab] OR (self directed[ti] AND learning*[ti]) OR (self directed[ot] AND learning*[ot])	TI ("self directed*" AND learning*) OR AB ("self directed learning*")	MH "Self directed learning" OR TI ("self directed"* AND learning*) OR AB ("self directed learning*")
#34	self regulated learning*[tiab] OR (self regulated [ti] AND learning*[ti]) OR (self regulated [ot] AND learning*[ot])	TI ("self regulated*" AND learning*) OR AB ("self regulated learning*")	TI ("self regulated*" AND learning*) OR AB ("self regulated learning*")
#35	situated learning*[tiab] OR (situated*[ti] AND learning*[ti]) OR (situated*[ot] AND learning*[ot])	TI (situated* AND learning*) OR AB ("situated learning*")	TI (situated* AND learning*) OR AB ("situated learning*")
#36	socialisation*[tiab]	TI (socialisation*) OR AB ("socialisation*")	TI (socialisation*) OR AB ("socialisation*")
#37	socialization*[tiab]	TI (socialization*) OR AB ("socialization*")	TI (socialization*) OR AB ("socialization*")
#38	student learning*[tiab]	TI ("student learning*") OR AB ("student learning*")	TI ("student learning*") OR AB ("student learning*")
#39	ward based learning*[tiab] OR (ward based*[ti] AND learning*[ti]) OR (ward	TI ("ward based" AND learning*) OR AB ("ward based learning*")	TI ("ward based" AND learning*) OR AB ("ward based learning*")

	based*[ot] AND learning*[ot])		

During the search and selection process, three concepts appeared in the literature that had been discarded before, but were added to the list of concepts to run the second search with after discussion in the research team. The total number of hits was calculated after this search.

Concept	PubMed	Ebsco/ERIC	Ebsco/CINAHL
#40	(peer learning*[tiab]) OR (peer*[ti] AND learning*[ti]) OR (peer*[ot] AND learning*[ot])	TI ("peer*" AND learning*) OR AB ("peer learning*")	TI ("peer*" AND learning*) OR AB ("peer learning*")
#41	Peer assisted*[tiab] OR (peer assisted*[ti] AND learning*[ti]) OR (peer assisted*[ot] AND learning*[ot]))	TI ("peer assisted*" AND learning*) OR AB ("peer assisted based learning*")	TI ("peer assisted*" AND learning*) OR AB ("peer assisted based learning*")
#42	(transformative learning*[tiab] OR (transformative*[ti] AND learning*[ti]) OR (transformative*[ot] AND learning*[ot]))	TI (transformative* AND learning*) OR AB ("transformative learning*")	TI (transformative* AND learning*) OR AB ("transformative learning*")

2.2 Number of hits per concept

	Concepts	Combination of searches with # from queries in the above table	PubMed (23 May 2018)	Ebsco/-ERIC (23 May 2018)	Ebsco/-CINAHL (23 May 2018)
1.	**Authentic learning**	#1 AND #2	32	6	23
2.	**Clinical learning/ clinically based learning/ clinical placement learning**	#1 AND (#3 OR #4 OR 5)	631	16	544
3.	**Experiential learning**	#1 AND #6	294	84	571
4.	**Experimental learning**	#1 AND #7	31	2	26
5.	**Hidden curriculum**	#1 AND # 8	26	1	18
6.	**Informal learning**	#1 AND #9	11	7	7
7.	**Learning by doing**	#1 AND #10	12	3	14
8.	**Learning clinical nursing/ learning the practice of nursing**	#1 AND (#30 OR #31)	205	0	31
9.	**Learning from/through experience/learning from clinical placement experience**	#1 AND (#11 OR #12 OR 13)	48	7	4
10.	**Learning in the clinical field/learning in the clinical context/ Learning in the clinical setting/Learning in the clinical nursing environment/learning in the clinical environment**	#1 AND (#19 OR #20 OR #21 OR #22 OR #23)	785	16	240
11.	**Learning on the job**	#1 AND #24	0	2	2

12.	**Learning process**	#1 AND #29	463	40	474
13.	**Learning in practice/learning form practice/ learning in practice environment/learning in practice setting/learning in a clinical practicum/practice learning/practice based learning**	#1 AND (#14 OR #15 OR #16 OR #17 OR #18)	176	10	205
14.	**Placement learning**	#1 AND #32	102	4	64
15.	**Practice based learning**				
16.	**Self directed learning**	#1 AND #33	1210	20	297
17.	**Self-regulated learning**	#1 AND #34	27	2	32
18.	**Situated learning**	#1 AND #35	25	4	17
19.	**Socialication/socialisation**	#1 AND (#36 OR #37)	380	35	372
20.	**Student learning**	#1 AND #38	543	66	663
21.	**Ward based learning**	#1 AND #39	0	1	2
22.	**Workplace learning/learning in the workplace/work based learning/work integrated learning**	#1 AND (#25 OR #26 OR #27 OR #28)	92	5	67
23.	**Peer learning***	#1 AND #40	106	4	31
24.	**Peer assisted learning***	#1 AND #41	23	0	3
25.	**Transformative learning***	#1 AND #42	60	17	19

** Search 23, 24 and 25 have been conducted on 16 september 2018.*

Supplementary file 4. List of potentially eligible concepts and their reason for inclusion/exclusion in the second search step after discussion.

	Inclusion?	Rationale
Active learning	no	Used exclusively for learning in the classroom setting
Authentic learning	yes	Is used as an equivalent to learning in clinical practice[1]
Blended learning	No	Used exclusively for learning in the classroom setting
case based learning	no	Used exclusively for learning in the classroom setting, simulation learning or online learning
clinical experience/ practice experience	no	Used to describe the overall experience of being in a clinical setting rather than the learning process
clinical learning	yes	Used as an equivalent to learning in clinical practice
clinical learning environment	no	Used to describe learning circumstances rather than the learning process itself
clinical learning model	no	Used to describe learning circumstances rather than the learning process itself
Clinical nursing education	no	Is used to describe the entire system (organization, supervision, contents etc.) within which learning takes place
clinical placement learning	yes	Used as an equivalent to learning in clinical practice
clinical skills learning	no	Used to describe a specific part (ie skills learning) of learning in clinical practice
clinically based learning	yes	Used as an equivalent to learning in clinical practice
Collaborative learning	no	Used to describe a specific way of organizing learning in clinical practice (ie learning in pairs)
concept-based learning	no	Used either for curriculum design of for specific learning activities in clinical practice
cooperative learning	No	Used to describing specific learning/ teaching activities
deep learning	no	Used exclusively for learning in the classroom setting, simulation learning or online learning
Deliberatie practice	No	Used to describing specific learning/ teaching activities
Didactic learning	No	Used exclusively for learning in the classroom setting
dual level learning	No	Used to describe a specific way of organizing classroom learning
empathy learning	no	Used to describe the learning of a specific skill (ie empathy)
Enquiry based learning	no	Used to describing specific learning/ teaching activities
Experiential learning	yes	Is as an equivalent to learning in clinical practice
Experimental learning	yes	Is as an equivalent to learning in clinical practice
Hidden curriculum	yes	Although this is not an equivalent to learning in practice, we decided to include this concept as it is used to

		describe a way in which knowledge and valued are transmitted in clinical practice outside specific teaching or learning activities
Informal learning	yes	Is used as an equivalent to learning in clinical practice
(Work) integrated learning	yes	Is (in some cases)[2] used as an equivalent to learning in practice
Integrative learning	No	Used for describing specific teaching and learning strategies
Intentional learning	no	Used to describe specific learning/ teaching activities[3] or competencies[4]
interprofessional learning	no	Used to describe a specific way of organizing learning in clinical practice (ie learning with and from other disciplines)
Learning by doing	yes	Used as an equivalent to learning in clinical practice
learning clinical nursing	yes	Used as an equivalent to learning in clinical practice
learning from/through experience	yes	Used as an equivalent to learning in clinical practice
learning from clinical placement experience	yes	Used as an equivalent to learning in clinical practice
learning from practice	yes	Used as an equivalent to learning in clinical practice
learning in a clinical environment	yes	Used as an equivalent to learning in clinical practice
learning in practice/ learning in practice environment/ learning in practice setting/learning in a clinical practicum	yes	Used as an equivalent to learning in clinical practice
Learning in the clinical field/learning in the clinical context/ Learning in the clinical setting/Learning in the clinical nursing environment/learning in the clinical environment	yes	Used as an equivalent to learning in clinical practice
learning in the practice setting	yes	Used as an equivalent to learning in clinical practice
Learning on the job	yes	Used as an equivalent to learning in clinical practice
Learning on the workplace/ workplace learning/learning in the workplace	yes	Used as an equivalent to learning in clinical practice
learning process	yes	Used as an equivalent to learning in clinical practice[5]
Learning situation	no	Used to describe learning circumstances rather than the learning process itself
learning the practice of nursing	yes	Used as an equivalent to learning in clinical practice[6]
learning through experience	yes	Used as an equivalent to learning in clinical practice
learning trajectories	no	Used to describe learning in a specific program[7]
Meaningful learning	no	Used exclusively for learning in the classroom setting[8] or simulation learning[9]
Online learning	no	Used for specific learning activities outside the clinical

		setting
Peer based learning/ peer learning/ peer assisted learning	yes[1]	Used to describe a specific central way learning in clinical practice
Perceptual learning	no	Used to describe a specific technique to learn in clinical practice
placement learning	Yes	Used as an equivalent to learning in clinical practice
Practice learning	Yes	Used as an equivalent to learning in clinical practice
Practice-based learning	Yes	Used as an equivalent to learning in clinical practice
problem-based learning/ problem based learning	no	Used exclusively for learning in the classroom setting, simulation learning or online learning
professional development	No	Used to describe the result of learning in the clinical setting, rather than the process
Reflective learning	No	Used to descrive specific teaching and learning strategies
Self-directed learning	yes	Used (at least in some studies, eg [10]) to describe a very important component of learning in the clinical setting, that is, the part that takes place at the learner's initiative).
Self-regulated learning	yes	Used (at least in some studies, eg[11]) to describe a major part of learning in the clinical setting, that is, the part that takes place at the learner's initiative).
Service learning	no	Used for the particular combination of providing (voluntary) community service and learning in practice
Shared learning	No	Used to describe a specific way of organizing learning in clinical practice (ie learning from and with others)
Situated learning	yes	Used as an equivalent to learning in clinical practice, [12]
socialisation/ socialization	yes	Used to describe a major part of learning in clinical practice
student learning	yes	Is, in some cases (eg [13]) used to describe learning in clinical practice)
task-based learning	No	Used to describe a specific way of organizing learning in clinical practice (ie around tasks[14])
team-based learning	No	Used exclusively for learning in the classroom setting
Transformational learning	No	Used to describe the result of learning in the clinical setting, rather than the process[15]
Transformative learning	yes[2]	Used to describe both process and outcomes of learning [16]
Ward based learning	Yes	Used as an equivalent to learning in clinical practice
Work-based learning	Yes	Used as an equivalent to learning in clinical practice
work-integrated learning	Yes	Used as an equivalent to learning in clinical practice

[1] Excluded in first instance as it appeared to be used to study interventions or specific organizational models. On the basis of results in search step 2, the concept was included in second instance.
[2] Excluded in first instance as it appeared to be used to study classroom learning only. On the basis of results in search step 2, the concept was included in second instance.

workplace learning	Yes	Used as an equivalent to learning in clinical practice

Supplementary file 5. Excluded full text articles and main reason for exclusion

1.	Not been able to retrieve full text of this study
2.	Study is about influencing factors, interventions, organizational models, personal characteristics affecting learning instead of the learning process itself
3.	Study is not about learning/ not possible to separate findings about learning from other findings
4.	No original study or review
5.	Study is incomplete (eg no results)
6.	Study is about a research methodology
7.	Another study within the same project is already included, this study offers no additional findings
8.	Study is too specific
9.	Study is not about clinical practice/ not possible to separate findings about clinical practice from other findings
10.	Study is not about nursing students/not about hospital setting

	1	2	3	4	5	6	7	8	9	10
Abe (1977)	x									
Allan, Smith, and O'Driscoll (2011)		x								
Alves and Cogo (2014)			x							
Andrade Bezerra, Soares Campos, and Da Silveira (2005)	x									
Arlton and Miercort (1980)				x						
Arrigoni et al. (2017)				x						
Baldwin, Mills, Birks, and Budden (2014)		x								
Barry, Ward, and Walter (2017)						x				
Brackenreg (2004)		x								
Burnard (1991)				x						
Burnard (1992)							x			
Charneia (2007)	x									
Coetzee (2004)								x		
Cope, Cuthbertson, and Stoddart (2000)		x								
Corbett (1973)		x								
Cowman (1998)		x								
Crouch (1991)	x									
Cullingford (1991)	x									
de Jesus, Sena, and Andrade (2014)									x	
de Jesus et al. (2014)		x								
Durgante Alves and Petersen Cogo (2015)			x							
Edwards (2013)						x				
Egginton (2002)	x									
Endacott, Scholes, Freeman, and Cooper (2003)		x								
Evans (1987)				x						
Friedman (1981)	x									
Green and Holloway (1997)						x				
Hauge (1999)	x									
Hauge (1999)	x									
Henderson et al. (2018)		x								
Henderson et al. (2018)	x									
Hill (2016)			x							
Hold, Blake, and Ward (2015)									x	
Holmsen (2010)		x								
Ironside, McNelis, and Ebright (2014)			x							

Kosowski (1995)								x	
Kuiper (2004)		x							
Levett-Jones (2007)				x					
Love (1996)		x							
MacFarlane and Hart (1995).				x					
May and Veitch (1998)		x							
Montagna, Benaglio, and Zannini (2010)		x							
More and Conklin (1995)		x							
Newton, Billett, and Ockerby (2009)		x							
Nolan (1998)			x						
O'Shea (2003)								x	
Paliadelis and Wood (2016)		x							
Papp, Markkanen, and Von Bonsdorff (2001)	x								
Polifroni, Packard, Shah, and MacAvoy (1995)			x						
Rajeswaran (2016)		x							
Reutter, Field, Campbell, and Day (1997)			x						
Rodríguez García, Ruiz López, González Sanz, Fernández Trinidad, and De Blas Gómez (2014)			x						
Sandvik et al. (2012)		x							
Shahsavari, Zare, Parsa-Yekta, Griffiths, and Vaismoradi (2018)			x						
Shin (2000)									x
Shirazi, Sharif, Molazem, and Alborzi (2017)								x	
Skaalvik, Normann, and Henriksen (2010)		x							
Smith and Morrison (2006).									x
Spouse (2001)			x						
Tagliareni (1991)	x								
Thrysoe, Hounsgaard, Dohn, and Wagner (2010).			x						
Tupala, Tossavainen, and Turunen (2004)									x
Vesanto and Munnukka (1996)	x								
Wilson (1994)			x						
Wong and Lee (2000)									x
Zhao, Kuan, Chung, Chan, and Li (2018).					x				

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