

How and what do medical students learn in clerkships? Experience based learning (ExBL)

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Abstract Clerkship education has been called a ‘black box’ because so little is known about what, how, and under which conditions students learn. Our aim was to develop a blueprint for education in ambulatory and inpatient settings, and in single encounters, traditional rotations, or longitudinal experiences. We identified 548 causal links between conditions, processes, and outcomes of clerkship education in 168 empirical papers published over 7 years and synthesised a theory of how students learn. They do so when they are given affective, pedagogic, and organisational support. Affective support comes from doctors’ and many other health workers’ interactions with students. Pedagogic support comes from informal interactions and modelling as well as doctors’ teaching, supervision, and precepting. Organisational support comes from every tier of a curriculum. Core

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learning processes of observing, rehearsing, and contributing to authentic clinical activities take place within triadic relationships between students, patients, and practitioners. The phrase ‘supported participation in practice’ best describes the educational process. Much of the learning that results is too tacit, complex, contextualised, and individual to be defined as a set of competencies. We conclude that clerkship education takes place within relationships between students, patients, and doctors, supported by informal, individual, contextualised, and affective elements of the learned curriculum, alongside formal, standardised elements of the taught and assessed curriculum. This research provides a blueprint for designing and evaluating clerkship curricula as well as helping patients, students, and practitioners collaborate in educating tomorrow’s doctors.

Keywords Affect · Clinical teaching · Experience based learning · Supported participation · Real patient learning · Undergraduate medical education

Introduction

A typical undergraduate medical curriculum has a pre-clerkship phase, when students lay theoretical and practical foundations for practice-based learning, followed by a clerkship phase, during which students are placed in functioning clinical units in hospital or community to learn about and from patient care activities. Over the last three decades, many medical schools have made their pre-clerkship phases less didactic, more experiential, and more learner-centred. They have integrated learning horizontally across disciplines and introduced problem-based learning (Schmidt et al. 2011) early clinical experience (Yardley et al. 2013) and clinical skills education (Van Dalen et al. 2001). Clerkship education, however, has developed in a more haphazard way (Cooke et al. 2010). When the educational principles that transformed pre-clerkship education have been applied to clerkships, clinical teachers have resisted change (Dornan et al. 2005b; Graham and Dornan 2013). Changes in health services, meantime, have driven unintended change: the rise of specialisation has fragmented clinical expertise, more specialties compete for students’ time, students learn in primary, secondary, and tertiary care, rotations are ever more complicated, and continuity is lost (Hirsh et al. 2007; Holmboe et al. 2011).

One response to this situation is to provide longitudinal integrated clerkships (LICs). This curriculum design, which was first introduced to encourage medical graduates to become general practitioners in rural Australia (Worley et al. 2000), has gained such popularity that a recent commentary called it ‘the most significant educational innovation in clinical education to have occurred in our lifetimes’ (Bates and Towle 2012). Defining features of LICs are that students participate in the comprehensive care of patients over time, have longitudinal learning relationships with those patients’ clinicians, and acquire core competencies across multiple disciplines simultaneously (Bates and Towle 2012; Bates 2013; Hauer et al. 2012; Hirsh et al. 2007; Norris 2009; O’Brien et al. 2012; Teherani et al. 2013). LICs are provided in urban, academic medical centres (Poncelet et al. 2011) and rural underserved areas, where they attract people to work after qualifying (Bates and Towle 2012). What LICs do best is help students develop the generic, professional attributes of doctors-to-be, though LIC students perform as well academically in internal medicine, surgery, paediatrics, psychiatry, and obstetrics/gynaecology assessments as students in traditional block rotations (Bates 2013; Bell et al. 2008; Hauer et al. 2012;

Hirsh et al. 2012; McLaughlin et al. 2011; O'Brien et al. 2012; Teherani et al. 2013; Walters et al. 2012).

Despite the appeal of LICs, it seems unlikely they will completely supplant rotation-based clerkships (RBCs). Evidence favouring LICs is mostly based on tiny numbers of students. The cost-effectiveness and feasibility of providing LICs for the cohorts of over 500 students per year, who attend some European medical schools, are unproven. Students need to learn from, and have the opportunity of being recruited to, disciplines other than the small number of ones typically included in LICs—internal medicine, surgery, paediatrics, gynaecology and family medicine.

Although RBCs have been the backbone of clinical education for a century, we know so little about what goes on in them that they have been described as black boxes (Shipengrover and James 1999). We thought it would be more sensible to open these black boxes and clarify the pedagogic principles that have made RBCs endure than to write them off. We have already opened the black box of pre-clerkship workplace education by assembling and analysing a large body of published evidence (Dorman et al. 2006a; Littlewood et al. 2005; Yardley et al. 2010) and decided to do the same for clerkship education. The review questions were:

1. What are the outcomes of undergraduate medical students' clerkship education in hospital and community?
2. What processes result in those outcomes?
3. What conditions affect those processes?

Methods

Conceptual and methodological orientation

The approach was to use qualitative methodology to develop a 'middle range theory' (Merton 1967) of clerkship education. Middle range theories are grounded in empirical findings. Conceptually, they are positioned between high range, 'grand' theories like Marxism, and personal theories that are 'low range' because they are not transferable. We decided to elaborate an existing middle range theory named Experience Based Learning (ExBL) rather than produce an entirely new one. ExBL, which is described in Box 1, is the product of a series of empirical investigations into how medical students learn in clerkships. It is consonant with the higher range Communities of Practice theory (Wenger 1998) which is a member of the socio-cultural family of theories (Hodges and Kuper 2012).

'Link' as the unit of analysis

Traditional medical systematic reviews are, according to the classification of Cook et al. (2008) 'justification research'. They synthesise quantitative, experimental evidence according to strictly defined, uniform procedures, which allow doctors to choose between alternative treatments. Medical education reviews (such as our own publication cited above), in contrast, often follow the 'description research' conventions of the Best Evidence Medical Education collaboration (Hammick et al. 2010). The research questions in this review called for 'clarification research', for which standard procedures are not available. The available evidence was both quantitative and qualitative. It could

Box 1 Experience based learning (ExBL)

This middle range theory, which is closely related to Communities of Practice (Lave and Wenger 1991; Wenger 1998) is a theory of how medical students develop the identity of doctors during their progression from medical school entrant to qualified doctor. It has been—and continues to be—developed by means of a series of investigations (Ashley et al. 2009; Bell et al. 2009; Dornan et al. 2005a, 2006a, b, 2009; Hay et al. 2013; McLachlan et al. 2012; Steven et al. 2014) which are thematically linked and together constitute programmatic research (Bordage 2007). The term ExBL brings with it an explicit focus on learning, in which experience in workplaces plays a central part (Dornan et al. 2007, 2009). Teaching contributes to ExBL but is certainly not its defining or even central feature so ExBL is a departure from the primary focus on clinical teaching that has been associated with clerkship education (Beckman et al. 2005). According to ExBL, medical students learn by participating in practice. Participation is located within triadic relationships between patients, doctors, and medical students in authentic workplace settings. Medical students can take on the roles of observer (passive or active) or actor (in rehearsal, or in performance). Participation occurs under conditions of support. The ExBL model identifies three categories of support: pedagogic, affective, and organisational support. So, the core condition for medical students' clinical workplace learning is supported participation. An integral part of participation is real patient learning (Bell et al. 2009) which is both a process that can lead to practical and affective outcomes, and a learning outcome in itself. Real patient learning, practical, and affective outcomes together constitute professional identity

support qualitative statements like: 'Students who learned in the outpatient setting obtained a greater breadth and depth of exposure to patients with common urological problems than those who learned in the inpatient/operative setting' [actual data coded in this research from (Kerfoot and DeWolf 2002)]. We developed a way of extracting trustworthy evidence (the word 'trustworthy' emphasises reliance on researchers' reflexivity, as is appropriate to a qualitative design) in the form of free text statements that some condition and/or process had led to a learning outcome. We use the term 'link' to describe those statements. The review procedure was to extract as many links as the evidence supported.

Inclusion criteria

- Any empirical research into the conditions, processes, and outcomes of undergraduate medical students' clerkship education, irrespective of methodology
- Clerkship 'experience', defined as: authentic (real as opposed to simulated) human contact in a clinical context that enhanced learning about health, illness, and/or disease, and the role of the health professional
- Any setting—hospital, family practice, and/or other community settings
- Rated 3 or higher on the BEME 'strength' scale (Box 2) as suggested by (Yardley and Dornan 2012): in other words, it was judged that the findings could probably support conclusions, were very likely to be true, or were unequivocal.

Exclusion criteria

- Not in the English language (because our previous experience was that papers in other languages were more nationally than internationally applicable) (Dornan et al. 2006a)
- Concerned simulation education or other 'non-authentic' experience
- In the pre-clerkship rather than clerkship phase of a curriculum

Box 2 BEME rating scale for strength of evidence

1	No clear conclusions can be drawn; not strong
2	Results ambiguous; there seems to be a trend
3	Conclusions can probably be based on the results
4	Results are clear and very likely to be true
5	Results are unequivocal

Search and selection of informative evidence

Search terms were chosen by scrutinising the review protocol, Glossary of Medical Education Terms, and Medical Subject Headings, together with suggestions from the research team. The search was refined in a series of stages: scoping search; modification so it was 100 % sensitive for a test set of 84 'best evidence' publications with the best achievable specificity; final search (for which the syntax is available on request from the authors). It was applied to five major databases (Medline, Embase, CINAHL, BEI and ERIC) for the period 1986–2006, yielding 88,394 hits, which were downloaded into EndNote bibliographic software (Thomson Reuters, Philadelphia) and, by elimination of duplicates, reduced to 74,484 citations. TD and NT randomly selected two thousand of them, independently reviewed their titles and abstracts, and applied and adjusted the selection criteria until they reached 100 % agreement about which articles to include. They then trained and supervised three other people to apply them. The five reviewers went through the remaining 72,484 'hits' by title and (if available) abstract and identified 906 relevant articles. If in doubt, they included rather than excluded articles. To keep the size of the review manageable, the review period was limited to 2000–2006 inclusive. Five hundred and fifty-four articles were retrieved in full text and taken to the coding stage, of which 168 contained evidence that fulfilled the selection criteria.

Coding

The team developed, trialled, revised iteratively, and finalised a proforma to code data to the ExBL framework. A systems analyst then used Wufoo (Infinity Box Inc, Tampa, USA) to develop a web-based version of it, which allowed coders in different places to contribute to a common database, inspect one another's codings, and work together to make judgements. The form included methodological details and fields derived from the ExBL model to represent conditions, processes, and outcomes of clerkship learning and links between outcomes and conditions and/or processes. Links were identified as described earlier and coded for their strength using BEME's 1–5 rating scale (Box 2). Because the article selection process had favoured sensitivity over specificity, many were found at this stage not to fulfil the inclusion criteria and excluded. Some important coding definitions were:

Outcomes (illustrated by actual examples)

Affective outcome Learning that pertains to a student's emotions and mood (for example: 'greater comfort in the presence of older people')

Practical outcome Having learned an attitude, knowledge, or skill, learned to learn, or learned a behaviour (e.g. 'measurable change in students' beliefs about the effects of ageing on bodily functioning')

Real patient learning Learning, which was neither an affective outcome, nor a practical one, but repeated or even single episodes of which contributed to a medical student's ability to care for patients (e.g. 'students gained valued real patient experience of disability and care for it in community')

Box 3 gives a worked example of the coding process and explains some of the terms used above.

Synthesis of findings and reporting

All data manipulations, further stages of coding, and analysis were done within Excel spreadsheets (Microsoft Corporation, Redmond, USA), duplicating and restructuring them as needed, and maintaining an audit trail back to the original dataset by saving successive versions. Three reviewers (TD, NT, and KM) organised the raw data, checked the first level coding, added sub-codes, analysed data, and synthesised the interpretation presented here. They discussed problems, agreed solutions, and sent interim reports of the analysis to other team members. AS helped TD, NT, and KM constantly compare the evolving interpretation against the original ExBL theory and refine it. TD then reassembled the entire dataset into a single master spreadsheet, corrected errors, and eliminated redundancy in preparation for writing the narrative report of findings. In line with qualitative research practice, validity depended on the collaborative effort of a deliberately eclectic research team, which worked collaboratively to support its members' reflexivity and prevent any one person's preconceptions having an undue influence on the findings. We first prepared a detailed report (which is available from the authors on request) in which every statement was supported by a code identifying the link and the paper from which it came. This paper is a condensed version of the report, from which the >500 link codes are omitted for the sake of readability; an example of four such codes taken from one publication is included in Box 3. The generally positive language used in reporting the results is not intended to mean that students had uniformly positive experiences; rather to support the logic that 'if condition A was fulfilled, outcome B resulted'. More positive than negative outcomes were reported, however, which may have been due to positive publication bias. We have addressed that possibility by citing negative examples below, as far as the literature permitted.

Results

Nature of the evidence

The final dataset consisted of 548 trustworthy links from 168 articles. Over half the studies came from the USA and Canada, nearly a third from Europe, and most of the remainder from Australasia. Just two papers came from South America and Africa. One-third of evidence came from undergraduate entry and two-thirds from graduate entry programmes. Programme length ranged from 4 to 6 years (with just one 7-year programme). Median programme length was 4 years, reflecting the predominance of North American 4-year programmes. Only one-third of papers reported the pedagogy of the programme in which the research was conducted and, even then, details were scant. Thirty-five were traditional curricula, 13 used PBL (of which four also included other types of curriculum integration), three were integrated non-PBL, one was student-centred, and one was systems-based.

Box 3 Worked example of how data were coded

Research in paper 280 of the bibliography of included articles contributed 4 of the final set of 548 links.

This box uses that research to exemplify the data extracted from an individual paper, which contributed to the final narrative of results

Methodological details:

Research methods: Evaluation of a complex intervention—at a pilot stage

Intervention: Pairs of medical students, who were close to the end of their undergraduate program, provided direct care to patients. They did so as members of teams of 6 health professionals, including occupational therapists, physiotherapists, and nurses. Their work was supervised by skilled nurses and coupled with both problem based learning and daily reflective sessions. The goal was to develop profession-specific roles and promote interprofessional teamwork within a real clinical setting

Setting: 12-bed training ward, which was part of a 27-bed teaching hospital musculo-skeletal ward

Duration and exposure: Daily shifts over a two-week block

Description of instructional approach: Experiential, but with very close generic and profession-specific supervision

Evaluation: The study arrived at its conclusions from a multi-method evaluation. Students completed a questionnaire about their learning outcomes. Also, there were group interviews with students at the end of their 2 week experiences and data were gathered by direct observation, focused on student ward-based work, handovers, and their reflective sessions. This paper was primarily orientated towards nursing students. There was an evaluation of staff and patient reactions to the intervention, but this analysis focused on students' outcomes

Conditions for learning

Organisational support: This intervention required high level organisational support both at the planning stage, and to sustain the intervention

Pedagogic support: This took the form of nurse facilitation, which also provided an expertise resource—interestingly, the different facilitation style of different nurses was noted, particularly regarding how directive they were about solving problems within the team and 'the extent to which they stressed individual accountability to the team'. There was a differential effect of those different facilitation styles on the team functioning and students' satisfaction with their experiences. Another facet of pedagogic support was the reflective sessions that were part of the intervention—they helped resolve tensions, which emerged between students' uniprofessional and interprofessional responsibilities. Finally, PBL was somehow a part of the intervention. It is not clear how it was, but it is clear it did not work very well

Affective support: This is not specifically mentioned, although the 'different styles' of different facilitators are mentioned and likely had an affective dimension

Process of learning

Level of participation: Actor in performance

This was, par excellence, an intervention which placed students, quite safely, in the role of actors in performance, but in a constructed interprofessional setting

Links

The combination of organisational and pedagogic support that led students to be actors in performance in the training ward led to them

- A) Real patient learning (Strength 5): ... gaining real patient experience of decision making related to the care of patients, which they had not experienced in conventional placements
- B) Affective learning; negative outcome (Strength 5): ... feeling overwhelmed by the responsibility of planning and delivering high quality care in limited time, whilst accepting a higher level of responsibility and having to form into an effective interprofessional team
- C) Affective learning; positive outcome (Strength 5): ... having positive affective outcomes—described as 'a positive view of the experience'
- D) Affective learning (Strength 4): ... adopting a shared identity, which supported teamworking, which was helped by all students wearing blue scrubs

Review question 1: Outcomes

These included real patient learning (167 links), affective outcomes (177 links), and practical outcomes (204 links).

1a Real patient learning

Students remembered individual patients and aspects of their lives and problems as a result of working in a clinic for homeless people and learning to “pay witness” to individuals rather than objectify them’. Bibliography of reviewed papers: No 307

Real patient learning was a distinctive, contextualised type of learning, which resulted from students’ interactions with real patients. Although we call it an outcome, it was as much a process because it was part of a continuum of becoming increasingly experienced. Theory became relevant to practice, contextualised, reinforced, integrated, and more memorable. Important topics came into focus and new perspectives opened up. Knowledge was integrated with attitudes and skills. Students came to understand the spectrum of disease: from minor and self-limiting problems to multi-system, chronic, and complex disease. They understood different aspects of practice; for example, disability care, and referral practice. They understood better how doctors and patients communicated in real life. Real patient learning was practical as well as conceptual. Students practised procedures, assisted surgeons, wrote case records, made decisions, managed patients, and saw patients’ illnesses progress. They gained the quantity of experience and the hours of supervised learning they needed to become doctors. There were negative instances of real patient learning too: the complexity and open-endedness of patients’ problems could overwhelm inexperienced students; the quantity and quality of their engagement with real patients could be insufficient; interactions in poor quality learning environments had opposite effects to those described above. In summary, positive clerkship experiences helped students transfer, restructure, consolidate, strengthen, and contextualise learning, attach it to memorable patient exemplars, and put it into practice.

1b Affective learning

Feeling low on the hierarchy of a clinical team made students feel too uncomfortable to speak up when witnessing unethical situations’. Bibliography of reviewed papers: No 131

Another distinct type of learning was affective, which included emotions and mood but extended to a state of mind, such as a feeling of legitimacy. Some affects were directed primarily towards ‘the self’: students developed a sense of belonging and comfort in the role of a student doctor, legitimacy in clinical settings, and a sense of themselves as future physicians. They became more confident to interact with patients, put clinical skills into practice, make management decisions, manage risks and failures, cope with uncertainty and relate to old, mentally ill, and dying patients. They experienced a sense of satisfaction and reward for the effort they had invested in studying and providing patient care. Some affects were directed primarily towards ‘the other’. Experience fostered compassion and a humane perspective. It increased empathy, idealism, and interest in patients’ life experiences.

Experience also caused negative affects. Particularly at transition points in curricula, students found it difficult to adjust to clinical settings, did not feel they were legitimate or belonged there, and felt uncomfortable wearing a white coat and assuming the role of a (student) doctor. They lost confidence, became demotivated, and felt unrewarded, dissatisfied, or frustrated. They were angry, emotionally uncomfortable, anxious, sad, and had poor mental health. Experience could also have negative effects on their empathy, idealism, and interest in patients. It could undermine students' respect towards and trust in teachers. Students could feel they did not have a legitimate voice, were low in the clinical hierarchy, not part of a clinical team, and abandoned. Their use of derogatory humour increased.

Affective reactions were complex: a single experience could cause both positive and negative ones at the same time. Positive reactions could mitigate previous negative ones; for example, by making students feel less depressed or anxious. In summary, clerkship experiences influenced students' confidence, motivation, satisfaction, mood, compassion, and sense-of-self in practice contexts and their affects towards patients and doctors, both positively and negatively.

1c Practical learning

Being an actor in performance helped students acquire the skills of teamworking, keeping notes, communicating in workplaces, physical examination, and the selection of appropriate tests. Bibliography of reviewed papers: No 202

Clerkship experience helped students learn how to practise. It integrated biomedical, psychosocial, practical, and contextualised knowledge with less clearly defined ways of knowing so that they understood practice rather than just knowing about it. For example, students came to understand the true complexity of becoming and being a doctor. They understood organisational aspects of practice and the range of professional roles and healthcare providers that contribute to patient care. They learned local policies and procedures and learned how to manage specific clinical situations within local contexts. They learned how to apply evidence-based medicine principles to practice. Likewise, clerkship experience helped students become skilled. They learned how to behave in a patient-centred manner: approach patients, communicate with them, and counsel them. There were general physical examination skills as well as system-specific ones. There were diagnostic and clinical management skills. Clerkships helped students learn how to manage their learning: how to identify learning need, seek out resources, and use them, and how to learn in an inter-professional context. They acquired research and presentation skills, and learned to evaluate data critically and think deeply about clinical problems. They learned to work diligently, be aware of their limitations, admit they did not know something, know when to call for help, and stimulate teachers to teach. Clerkships also affected students' attitudes: towards the care of vulnerable people; towards ethical aspects of care; towards their advocacy roles; team-working; the roles of other healthcare professionals; and towards medical specialties, their type of work, their contributions to healthcare, and the prospect of taking up careers in them.

There were negative as well as positive instances of all those practical outcomes. One negative finding, which deserves special mention, was a high incidence of needlestick injuries due to inadequate workplace learning of aseptic precautions. Another important finding was that clerkships could stimulate disorganised and surface learning. The evidence base contained limited evidence about the effects of clerkships on students' actual

behaviours, as opposed to their capability to demonstrate behaviours when assessed. In summary, positive clerkship experiences could help students understand as opposed to know about practice. Positive experiences helped students perform the tasks of doctors in context as opposed to demonstrate skills in test situations, develop attitudes that helped them work in an interdisciplinary context, and manage themselves and their learning in practice settings.

Review question 2: Processes

2a Instructional designs

Some reports gave little detail about what students experienced. When the intervention was 'a clerkship', students were told what tasks they should perform, asked to immerse themselves relatively independently in the care of patients, given a range of experiences to choose from and some supervision, and given feedback. When the intervention was 'a preceptorship', a student was attached to a single person (usually a clinician but sometimes a more senior medical student) for a period of time, during which the student followed up patients, performed authentic clinical tasks, and learned complex skills under supervision. When the process was a patient/family 'visit', students visited patients on their own, with a single allied health professional, or with a team, performed prescribed tasks, observed, and modelled on qualified health professionals, carried out written tasks and met in tutorial groups to discuss their learning. Sometimes, visits were multiple, which allowed students to build longitudinal relationships. When the intervention was a 'patient journey', one or more students built a longitudinal relationship with a person and their family in order to understand what it is like to be sick (or healthy). The students carried out prescribed tasks, kept portfolios, and were supervised by tutors. Other interventions included secondments to allied health professionals, clinics, and communities outside formal health services. There were also internships, when students performed the duties of a doctor before they were qualified. In summary, clerkship education included a range of instructional designs, which allowed students to learn by interacting with real patients.

2b Types of participation

The extent to which students were (non-) participants in practice was of particular interest given the conceptual orientation of the study towards Communities of Practice. It was not possible to extract information from 90 papers (54 % of the total), either because students took on multiple roles, or because information was lacking. In 11 studies, students' highest level of integration into practice was observing; in 30 studies, students rehearsed the tasks of doctors but did not contribute to patient care; and in 37 studies, students were integrated into authentic practice and contributed to patient care. Students achieved highest levels of participation in practice when they were designated patient care tasks like assessing patients, assisting in operating theatres, counselling patients about smoking, delivering babies, delivering preventive health care, performing practical procedures or tasks that would otherwise be done by residents, or running an inter-professional patient ward. In summary, the instructional designs described in the previous paragraph allowed differing degrees of participation in practice, from observing to directly participating in patient care. The clearest evidence of participatory learning came from the most structured experiences.

Review question 3: Conditions

Contributions from faculty at every level determined whether the processes described above happened or did not happen and therefore whether and how students achieved the described learning outcomes—from Deans managing curricula to clinicians interacting supportively with individual students. In successful curricula, faculty worked together to plan, resource, and deliver experience, and they interacted with students informally as well as in formal educational roles. Figure 1 shows how the different types of support operated at different curriculum levels.

3a Planning experience at curriculum level

Faculty invested effort into designing or revising curricula, adding new curriculum components, and putting components in appropriate sequences. They ensured continuity of experience, access to a variety of experiences, and opportunities to participate in practice that were appropriate to students' level of experience.

3b Resourcing experience at curriculum level

Experiences were funded, other educational resources were made available to students, teaching time was protected, and teaching rooms were made available. Faculty used the available resources to optimise continuity. They balanced numbers of students to the available casemix to ensure students were able to participate. They arranged for students to learn in provider organisations that offered a wide range of specialties and were relatively easy to get to. As well as hospitals, there were clinical learning opportunities in community sites, prisons, and other settings that were culturally unfamiliar to students. Within hospitals, there was experience in outpatient clinics, wards, operating theatres, intensive care units, and clinical teaching wards. Faculty brought district hospitals with different case mixes and lengths of stay as well as rural/community hospitals into their undergraduate programmes.

TYPE OF SUPPORT	ACTIVITY	LEVEL OF SUPPORT		
		1. Curriculum	2. Placement	3. Individual interactional level
Organisational	Planning	☐		
	Resourcing	☐		
Organisational and affective	Delivering		☐	
Pedagogic and affective	Formally supporting learning			☐
	Informally supporting learning			☐

Fig. 1 Relationships between levels and types of support

3c Delivering experience at placement level

Clinicians orientated students to the structure of placements, told them how much of what types of experience they should get, and provided means of logging experience. They arranged contact between students and relevant patients, or at least told students where they could find relevant learning opportunities. Clinicians worked in ways that made them accessible for one-to-one contact. They structured experiences, provided space for students to see patients alone, and organised their services to give students authentic roles and responsibilities. They created opportunities for students to work alone, be supervised, and receive feedback. They complemented clinical experience with group learning activities.

3d Formally supporting individualised learning

Clinicians filled the roles of mentors, preceptors, and supervisors. They instructed students at patients' bedsides, observed them performing skills, and gave feedback. They adapted their teaching to individual students' needs, briefed students on tasks they should perform, debriefed them, and were enthusiastic in their role. They supplemented clinical experience with teaching in skills laboratories, and in small and large groups.

3e Informally supporting individualised learning

Clinicians also optimised learning from participation in practice in many informal ways. They talked with students, asked and answered questions, drew them into ward round case discussions, allowed time for discussion, listened, and offered suggestions. They allowed students to perform tasks, delegated tasks to them, involved them in workplace activities, and directly facilitated students' interactions with patients and their families. In their practice, they (often unconsciously) modelled clinical and academic competence, caring behaviour, good interpersonal skills, positive attitudes, good manners, evidence-based practice, and ethical behaviour. They showed a sense of responsibility and were willing to give time to students and other people. Effective models often had good teaching skills as well.

Affective support was a vital component of individual interactions. Clinicians behaved supportively within tutorial interactions, were respectful towards students, open, willing, friendly, kind, helpful, and caring towards students and patients. They were enthusiastic and encouraging, inspired confidence, and showed they enjoyed teaching. It was possible for clinicians to be both demanding and supportive if they behaved in a friendly way. Clinicians promoted students' participation and identity development by acknowledging them, making them feel invited or valued, and not allowing them to feel uninvolved, in the way, or a burden. Positive relationships between teachers and students—particularly respectful and trusting ones—built rapport, helped students feel part of teams, and helped them interact with patients. Getting to know students as individuals, being patient, encouraging them to be self-aware, ensuring they participated in teaching sessions, and sharing personal experiences helped students learn. Even something as simple as the tone of a clinician's voice could make interactions feel more or less supportive.

3f Unsupportive learning environments

Negative instances were mirror images of positive ones. Clinicians harassed students, belittled them, abused them, provided unsupportive feedback, did not allow them to

express discomfort, and discriminated against them on grounds of gender. Some clinicians provided negative role models and taught by humiliation, which led students to become cynical and make jokes at the expense of patients. Students could feel compelled to perform intimate examinations without knowing if patients had consented. Students' reactions to placements could be unsupportive. Some placements provided no teaching, feedback, or help to link clinical experiences with theoretical learning. Financial constraints are ubiquitous and will not be considered further here, but two other constraints deserve mention. One was the trend towards residents working shorter hours and the other was increasing physician workloads, both of which reduced the ability of faculty to support students' learning.

In summary, students achieved the range of learning outcomes described earlier when faculty, planned, resourced, and delivered students' experiences, and supported their individualised learning both formally and informally. There were three important dimensions of support: affective, pedagogic, and organisational support.

Discussion

Lave and Wenger coined the term Community of Practice to describe how people learn to work nowadays (Lave and Wenger 1991) which is characterised by many-to-many relationships within groups of workers, through which learners become progressively more engaged into the core work of communities. Workers develop their core competences, not solely by working with generalists, but by navigating their way through whole landscapes of practice, including specialist practice (Wenger-Trayner and Wenger-Trayner 2013). The same is plainly true of medicine: increasing numbers of students learn from increasing numbers of doctors who work in large teams with allied professionals, some of whom are generalists and some of whom are specialists, and many of whom work shifts and rotate frequently. Being 'thrown in at the deep end' to learn by trial and error cannot be tolerated because it is a threat to patient safety so students' opportunities to provide care directly to patients are becoming increasingly limited. Many students' experiences are fragmented and impersonal (Holmboe et al. 2011). This review found reports of RBCs which had all those negative features but it also found a wealth of evidence showing how, if conditions allowed important processes to take place, valued learning could take place. Because the inclusion criteria were so broad, those findings are applicable to any curriculum design or context. They are applicable to LICs as well RBCs.

Several clear conclusions can be drawn. First, clerkship education does not just happen. Students learn when faculty at every level of a medical school work diligently and make imaginative use of resources to create conditions for their learning. Second, clerkship education has outcomes that differ from the competencies that are used to blueprint assessments and judge proficiency. Students develop a sense of themselves as (future) doctors, become able to provide compassionate patient care, learn to work in different contexts of care, and have the breadth and depth of experience that makes them proficient in the tasks of newly qualified doctors. Third, there is a whole range of clinician behaviours that are not really covered by the traditional use of the term 'clinical teaching', which support the achievement of those outcomes. The most important behaviours are behaving supportively, motivating students to learn, including them in patient care activities, and engaging them into all manner of different communicative activities related to patient care. Clerkship education has been slower to change its gestalt from teaching to learning than pre-clerkship education, where learner-centred educational methods are commonplace.

This review is intended to help patients, doctors, and clerkship and curriculum leads make that change in gestalt so they help students' learn by being supported participants in authentic patient care activities.

A review is only as useful as the implications for educational practice and research that can be derived from it. We therefore present the revised middle range theory of ExBL in Box 4 as a blueprint for providing and evaluating clinical clerkship education. Whilst the blueprint is expressed in positive language, the evidence on which it was based was negative as well as positive; the absence or poor quality of conditions and processes led to negative outcomes or failed to lead to positive ones. Figure 2 complements Box 4 with a pictorial model of ExBL. It is centripetal, starting from the outer shell of a supportive curriculum. It moves through the social layer of interaction between clinicians, patients, and students towards the innermost layer, a student's identity. Affects, as well as practicalities, run through the model, and are placed at its centre.

The main strength of the study is that every assertion in the blueprint for clerkship education is based on trustworthy empirical evidence of links between causes and effects so it is reasonable to assume the recommendations will lead to positive outcomes. What the review has not done, because it would make its scope too broad, is to explore the dynamics of condition-process-outcome links. Other limitations are that the review was restricted to a time period, which excluded recent publications. Since medical education is a fast developing research field, methodologically strong data have inevitably been omitted. Our intention, however, was not primarily to reflect the 'cutting edge' of clerkship education—particularly the LIC movement—but to make explicit a traditional part of undergraduate medical education, which has hitherto been reported piecemeal or left implicit.

As with any literature review, our conclusions are only as good as the available evidence. An important blind spot in studies we reviewed was a failure to differentiate between students with different inherent levels of motivation, ability, and learning need, which may have led us to over-estimate what can be achieved by giving learners more support. There was also an excess of positive over negative outcomes, which might be evidence of the positive reporting bias reported in earlier reviews (Dornan et al. 2006a).

Our findings need to be considered in relation to three important theories, as well as Communities of Practice (Wenger 1998). First, the reciprocal relationship between the supportive qualities of learning environments and the behaviours of students that we report here is a central feature of Billett's theory of relational interdependence (Billett 2006). Second, the publications of Eraut [for example (Eraut 2004)] have consistently emphasised that most workplace learning is informal, that professional learning is strongly contextualised, and that a substantial amount of re-learning is involved in the transfer from medical school to practice. Finally, concern has been expressed that outcome-based education, as advocated by Harden et al. (1999) and by Cooke et al. (2010) may not be as applicable to learning processes as it is to blueprinting assessments (Morcke et al. 2012). Whilst some of our practical learning outcomes were clearly competences, most affective and real patient learning was not. Curricula, we argue, must recognise and value those aspects of learning that cannot be taught and tested as competences as well as those that can be.

The implications for practice summarised in Box 4 are strongly enough evidence-based for curriculum leaders to feel safe implementing them, provided the implementation is carefully evaluated. The contents of Box 4 might be useful to curriculum leaders or peer reviewers evaluating a clinical curriculum. Whilst we can confidently recommend that learners should participate in practice as much as possible, the available evidence equipped us less well to say how that should be ensured. Task-based learning (Harden et al. 2000) is

Box 4 A blueprint for clerkship education

Medical students learn in clerkships as a result of *supported participation in practice*

1. Outcomes: real patient learning, affective, and practical learning

a. Real patient learning: A contextualised type of learning takes place within students' interactions with real patients. Students bridge theory with practice, contextualise, reinforce, and integrate what they have learned. They understand the complexity and spectrum of disease. They put skills like performing practical procedures and writing in case notes into the context of individual patients. They attach their learning to memorable patients and build up hours of experience from a quantity and type of casemix, which prepares them for practice

b. Affective learning: This includes students' emotions, mood, and state of mind. Some affects primarily concern students themselves: they include confidence, motivation, reward, and a sense of legitimacy and belonging in clinical settings. Students develop a sense of themselves as future physicians. Some affects are directed towards others: qualities like compassion, humanity, empathy, idealism, and interest in and a sense of responsibility towards people

c. Practical learning:

Students learn to practise by achieving the following learning outcomes:

i. Knowledge: They develop an integrated understanding of how to become and be a doctor, of organisational aspects of health care, and of professional roles

ii. Skills: They learn to perform skills in the context of practice. They learn how to behave towards patients and professionals and acquire new skills like applying evidence-based principles to practice

iii. Attitudes: They develop attitudes, for example, towards vulnerable people, ethical aspects of care, and towards the roles of themselves, other professionals, and different medical specialties in providing care

iv. Study skills: They learn how to manage their learning and learn in an inter-professional context. They learn presentation and critical appraisal skills

2. Process: participation

And doctors provide contexts for participatory learning

Instructional designs: There are many different ways of organising opportunities for students to develop such relationships. They may be placed within functioning clinical units, where they immerse themselves in patient care activities under supervision and interact with the personnel of the unit. They may be placed in preceptorships, where their learning is organised around the activities of a single practitioner. Learning may be organised around patient visits or journeys. Students may visit clinics or wards. They may be seconded to allied health professionals, clinics, or communities outside formal health services. They may work as interns, when they perform the duties of a doctor before qualification under appropriate supervision

Types of participation: Students observe, rehearse, and contribute to authentic patient care activities.

They are best able to learn by participation when they are given specific patient care tasks –performing procedures that would otherwise be done by residents and other ones like delivering babies or running an inter-professional ward

3. Condition: support

Learners participate in practice and achieve the outcomes listed above when three types of support are provided: pedagogic, organisational, and affective support. For learning to be optimal, all three types of support have to be provided, which calls for input from every level of a medical school: the curriculum, placement, and individual interactional levels

a. Planning experience at curriculum level: Organisational support at this level includes devising or revising curricula, adding new components, sequencing students' experiences appropriately, and ensuring continuity of experience. It involves providing access to a variety of experience, and ensuring participatory experiences that are appropriate to their current level of proficiency

b. Resourcing experience at curriculum level: As well as fiscal support, this includes ensuring resources like teaching rooms and teaching time are available to students. It includes balancing numbers of students to the number of doctors and availability of casemix, and using resources to help student learn in provider organisations with good learning opportunities, which may include district or rural hospitals. Within hospitals, it may include giving students access to different wards, outpatient clinics, or day care units

Box 4 continued

c. Delivering experience at placement level This involves welcoming and orientating students, making clear what is expected of them, and arranging opportunities for them to meet relevant patients. It involves organising the activities of a clinical unit in ways that are conducive to education and optimise participation

d. Formally supporting individualised learning: This means preceptors, mentors, supervisors, teachers and others instructing students, observing their performance, and giving feedback based on observation. Faculty adapt their ways of working to meet students' individual needs, brief them, debrief them, and do so enthusiastically. It means providing small group learning activities or skills laboratory instruction to complement on-the-job experience

e. Informally supporting individualised learning: There are many informal ways faculty optimise students' learning from participation in practice. These include talking informally, asking questions, answering them, drawing students into ward round discussions, and being prepared to listen and offer suggestions. It involves modelling good professional behaviour, showing a sense of responsibility, and having time for students. Whilst affective support is a vital component of all interactions, informal interactions provide unique opportunities for being respectful, open, willing, friendly, kind, helpful, and caring. Informal interactions allow faculty to inspire students and project positive attitudes onto them. Being kind does not mean being soft, though students respond to challenge best under conditions of support. Informal support helps students be part of teams and interact with patients

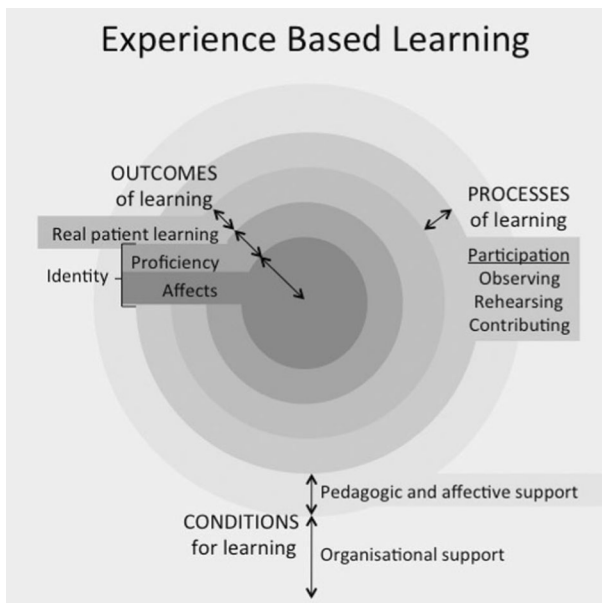


Fig. 2 Pictorial model. Within conditions of organisational support at institutional and placement level, and pedagogic/affective support at the placement and interactional levels, learners participate in practice by observing, rehearsing, or contributing to practice, which results in real patient learning and construction of professional identity, whose two interrelated components are proficiency in workplace activities and affects

a pedagogy that could fill the gap and our own research has shown how involving learners in the communicative practices of workplaces can support their learning (Steven et al. 2014). Whilst there is nothing new about saying that students should learn from real patients (Spencer et al. 2000) the general shift from curricula based on 'being there and

gaining experience' (Hodges 2010) to outcome-based curricula (Cooke et al. 2010) might devalue some of the less easily measurable benefits of patient contact. Perhaps the most practically important of all our findings is the omnipresence of affects—in both processes and outcomes—which tend not to be given the same importance as 'harder' features of workplace learning like knowledge and skills. Curriculum leaders might, on the evidence presented here, strive to make learning environments affectively supportive, promote supportive interactions between practitioners and learners, and encourage practitioners and learners to identify and reflect on affective outcomes, and how they relate to learners' identity construction. Sustaining learners' motivation, as has been previously noted, is an important task for clinical educators (Mann 1999).

As well as providing a framework for curriculum design, the blueprint for clerkship education makes numerous assertions that could be researched within the various contexts of contemporary health care. 'Complex intervention' research (Craig et al. 2008) perhaps within design-based research designs (Kelly 2003) would be the most appropriate way of doing so. Our findings reveal two important gaps in the evidence base, and one area for further exploration. First, evidence about the interactional nature of participation is strikingly inadequate. Second, the practical outcomes of learning tend very much to focus on declarative knowledge (basic science knowledge and clinical facts) as might be tested in summative assessments, but not so much on the practical know-how that is important to newly qualified doctors and/or acquired through the informal, social processes of workplace learning. A research area that is ripe for further exploration is the place of emotions in the conditions, processes, and outcomes of clinical education.

Conclusions

This review has provided a blueprint for clerkship education, which is transferable across primary, secondary, and tertiary care. It can be applied to longer and shorter attachments, and to integrated and non-integrated ones. According to the blueprint, there are three types of learning outcome: real patient learning is a complex type of outcome, which differs from a competency because it is more to do with contextualisation, reinforcement, and integration of learning than new learning per se. Affective learning includes aspects of medical students' learning and identity development, which are more complex and individual than more standardisable and measurable constructs like professionalism. Practical learning includes well-recognised learning outcomes like knowledge, skills, and attitudes, though they are contextualised and individual. It includes the acquisition of learning skills, which enable students to be effective workplace learners. Learners acquire those outcomes by participating in practice. They observe, rehearse, and perform the tasks of doctors within usual patient care and engage with patients and professionals in activities that complement their practice-based learning. Those learning processes are fostered by support, which is provided at every level of a medical school, from the curriculum to the individual interactional level. Organisational support ensures that clerkship experiences are part of an appropriate curriculum sequence and provide appropriate continuity, access to practice, and opportunities to participate in practice. Pedagogic support is provided by the clinicians encountered by students in workplaces as teachers, mentors, supervisors, preceptors, role models and sources of informal support to practice-based learning. Affective support is provided by everybody who learners meet during clinical placements. It includes providing a warm and supportive learning environment, interacting in an emotionally supportive

way, fostering confidence and motivation, and inspiring learners to become effective doctors.

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