UNIVERSITY OF Southampton

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Literature Review – Medicine (Southampton)

S Omer PhD

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Contents

Methods

We conducted a PubMed literature search using the BEME Guide No. 3 (Haig and Dozier 2003) for tips on defining and setting out the scope of enquiry. We identified articles published since December 2000 by constructing literature searches for the following:

- Student transition to clinical practice
- Workplace learning and student transition
- Orientation to clinical placement.

Our inclusion criteria for relevant articles were limited to medical student learning, as opposed to nursing, radiotherapy, dentistry or other health professional discipline. We also focused on original research articles that particularly addressed medical student transitions from pre-clinical to clinical learning as opposed to other transitions in the medical education trajectory, for example, the graduate student transition to junior doctor. We reviewed the abstracts to narrow down the search results to 40 relevant articles. We used a snowballing technique and searched the authors' references and identified an additional 20 relevant articles. The studies that we particularly focused on in this review were those that shed light on our preliminary findings from the qualitative data.

Origin: The majority of the articles originated from the USA (45%) and UK (27%) and the Netherlands (20%). Also represented were Australia, New Zealand, Turkey and Indonesia (8%). Five of the articles identified were reviews (8%) the rest described original research.

Periodisation: From the early 1900s to early 2000s research studies focused on stress and anxiety in medical education. In the mid-2000s studies that explored the student anxiety particularly in relation to transitions form classroom to clinical learning started to emerge in the medical education literature. As transition challenges were beginning to be better understood, studies on curriculum innovation to address these identified challenges followed suit from mid-2000s to present.

Methods: The methods used in the research articles can be classified into quantitative (48%), qualitative (27%), innovation description linked with student outcome (12%) and mixed studies that often had combinations of qualitative, quantitative, observation, student performance (5%). Most of the studies exploring the challenges that students face in the transition to clinical learning draw on students' perspectives using focus groups, interviews and self-report questionnaires. The majority of these studies were post hoc, none were ad hoc, only one looked at perceptions of second year students to gauge their anxiety about upcoming experiences in their third year (Small, 2008).

Introduction

> *Transitions can represent both threats and opportunities: each transition involves a fundamental re-examination on who and what we are. The feelings of uncertainly can inspire individuals to either develop new modes of behaviour or to try to change their context. In this process of adjustment lies an opportunity to learn.* (Teunissen *et al.* 2011)

Medical students develop competence primarily through experiential learning, but they must struggle through a challenging transition from the structured classroom environment to the clinical workplace. Several studies have documented the high level of stress and anxiety among medical students at this point of transition (Moss *et al.* 1992; Radcliffe *et al.* 2003). The stress that students experience relates to the differences in learning environments, teaching styles and workload between the pre-clinical and clinical environments. During this transition students adjust to these differences and simultaneously adopt a new role of a medical team member and carer for patients' 'professional socialization' (Prince *et al.* 2005). It is up to medical educators to transform the students' experience during this transition by enabling them to cope with changes, recognise learning opportunities and take responsibility for their own learning. However,

> *Medical educators are relatively unsophisticated at distinguishing between formative struggles that advance learning and adverse struggles that distract from or impede learning.* (O'Brien *et al.* 2007).

The purpose of this review is to help medical educators understand the nature of this transition to enable them to enhance the students' learning experience during this time. We summarise relevant and recent literature relating to the four research questions:

1. How do medical student experience transition to clinical learning?
2. What affects transition to clinical learning?
3. What impedes effective teaching in clinical settings?
4. How are these transition challenges addressed?

In the first sections of this review we summarise the challenges that the students face and explore the different factors that influence this transition. We then highlight the barriers that impede effective teaching in clinical setting and describe recent changes in the NHS structure and policy. Medical universities are increasingly aware that pre-clinical students may not be well prepared for this transition. We describe recent curriculum changes and pedagogical strategies initiated by medical universities in an attempt to address the identified challenges and ease the student transition to clinical learning. We conclude with models for effective learning in the workplace.

How do medical students experience the transition to clinical learning?

Many students experience 'shock of practice' when they transition from classroom to clinical learning as their role changes from one who is taught to one who is providing patient care. They report uncertainties about: their new roles; adjusting to new environments and workload; adjusting to new learning styles; confidence in their knowledge and skills; and concern about performing clinical skills. The challenges that students in transition face are grouped into themes and summarised in Table 1.

Prince *et al.* performed a qualitative study to explore students' perceptions and attitudes regarding the transition from theoretical training to clinical training (Prince *et al.* 2000). The study cohort included fifth year medical students (20) from Maastricht Medical, students who had completed four years of preclinical training in an integrated problem based curriculum (PBL). Students reported negative experiences associated with professional socialisation-adjusting to new environment and workloads and experienced difficulties in applying knowledge and skills in the clinical setting. The researchers later performed a follow-up study to seek

quantitative verification of the qualitative finding that they had previously identified (Prince *et al.* 2005). All fourth year medical students (106) were surveyed on the transition from pre-clinical to clinical training. The survey results confirmed earlier finding and related transition challenges due to the sudden increase in workload, insufficient time for studying and difficulty putting theory into practice and the necessity to adopt different learning strategies. Another qualitative study that explored students' perspective regarding the transition to the clinical phase of a medical curriculum with pre-clinical patient contacts showed similar findings (Godefrooi *et al.* 2010). These include: professional socialisation challenges; stress due to increase work hours and workload; and perceived lack of knowledge. However, in this study students reported that their transition was gradual, in contrast to the 'shock of practice' described earlier by Prince *et al.* In this case, the early patient encounters in the previous years had increased the students' self-confidence, motivation and clinical reasoning skills facilitated their transition to clinical practice.

Seabrook explored the effect of the learning climate on the students' transition to clinical training (Seabrook 2004). The findings from a five-year longitudinal study in a single medical school showed that students at the beginning of their clinical training were motivated by patient contact and simultaneously daunted by their perceived limited knowledge or required learning style. Students associated positive experiences at clinical sites where: staff were friendly and available; helped them to access resources and introduced them to patients; made their expectations clear; and made them feel part of the team. Aspects that were considered unhelpful for their learning included: their lack of a clinical role and feeling 'in the way'; senior staff's cancellation of teaching or late arrival; and repeated questioning until they answered wrongly. Some students perceived that their individuality was often not valued, for example the quiet students who had to appear more confident or having to conform to the style of the clinical teacher in that firm.

O'Brien *et al.* explored the relationship between students and clerkship directors perceptions of students' struggles with the transition to clinical training (O'Brien *et al.* 2007). Third and fourth year students and clerkship directors from ten US medical schools were asked similar questions in focus groups and interviews regarding transition challenges. Clerkship directors and students in this the study cohort agreed on transition challenges that concerned: engaging in self-directed learning; adapting to the hospital culture; and using clinical knowledge and reasoning. Students identified additional transition challenges relating to: coping with frequent changes in settings and teams; managing logistical information; understanding roles and responsibilities and expectations; and performing clinical skills.

Several studies explored the anxieties of new clinical students, and in particular, the stress associated with the transition to clinical learning. Radcliffe and Lester explored the views of Year 5 UK Medical students (20) on the causes of stress throughout their undergraduate medical training through semi-structured interviews (Radcliffe *et al.* 2003). The researchers categorised the perceived causes of stress during undergraduate medical training into four themes: stress secondary to pressure of work; stress associated with professional socialisation; stress due to lack of guidance; and stress due to transitions. Their finding showed that stress appeared to be greatest at transition points, particularly between pre-clinical and clinical training, when professional socialisation is a key.

Contributing factors

Moss *et al.* studied the specific anxieties of UK students (74) at the beginning of their clinical training (Moss and McManus 1992). Students completed a questionnaire and ranked 40 possible causes of anxiety. The authors showed that students perceived relationships with senior staff to be anxiety-inducing and, in particular, presenting cases in ward rounds and admitting ignorance to consultants. Students were also anxious about performing tasks on patients. Haglund *et al.* measured stressful events that third year medical students experienced (Haglund *et al.* 2009). Students were confronted with a substantial number of stressful events during their third year that had different effects on their learning. Despite repeated exposures to patient death and suffering, many students reported personal growth associated with these events if they felt supported by team members. In contrast, personal mistreatments (humiliation) and poor role modelling by

superiors had only adverse effects. Other studies in US medical universities showed that episodes of verbal abuse or public belittlement during clinical training (Schuchert 1998; Elnicki *et al.* 2002) resulted in loss of confidence and poor learning environments. Similarly, in a nationwide survey of all medical students in New Zealand *et al.* showed that two thirds of the students experienced at least one adverse experience, with humiliation being the most common and having the greatest adverse effect on learning (Wilkinson *et al.* 2006).

Table 1. Student struggles during early clinical experiences

Student struggles	**Description**	**Study citation**
Uncertainty about roles and responsibilities	-Knowing what their roles were and what they were expected to do -Feeling lost, useless or in the way	(Pitkala *et al.* 2003; Seabrook 2004; Dornan *et al.* 2007; O'Brien *et al.* 2007; Godefrooij *et al.* 2010)
Adjusting to new environment	-A drastic increase in the work load -Long hours and less time for studying	(Prince *et al.* 2000; Radcliffe *et al.* 2003; Prince *et al.* 2005; O'Brien *et al.* 2007)
Adapting to self-directed learning	-Learning changes from passive acquisition of knowledge to more active and self-directed learning	(Seabrook 2004; Prince *et al.* 2005; White 2007)
Applying knowledge	- Perceived shortcomings in basic science knowledge -Difficulty in applying theoretical knowledge in clinical practice -De-contextualised knowledge not integrated with clinical knowledge used in clinical practice	(Godefrooij *et al.* 2010) (Prince *et al.* 2000; Seabrook 2004; Prince *et al.* 2005; Godefrooij *et al.* 2010) (O'Brien *et al.* 2007)
Working with patients	-Concern for the patients' well-being -Patients not wanting to talk to them, -Lack of confidence in their knowledge and skills to perform clinical tasks on patients and worries about appearing incompetent -Uncertainty about whether to prioritise efficiency or thoroughness -talking to psychiatric patients and dealing with death and suffering	(O'Brien *et al.* 2007; Bell *et al.* 2009; Mathieson *et al.* 2009) (Bell *et al.* 2009) (Moss *et al.* 1992; Radcliffe *et al.* 2003; Sarikaya *et al.* 2006; Mathieson *et al.* 2009) (O'Brien *et al.* 2007) (Firth 1866; Ratanawongsa *et al.* 2005)
Logistics	-Learning the logistics of different clinical settings -Encountering frequent changes in staff, settings and contexts	(O'Brien *et al.* 2007)
Adapting to new teaching styles and relationships with senior staff	-Differences in the teaching styles and approaches -Stressful interactions with senior medical staff (e.g. teaching by humiliation during ward rounds -Perceived lack of commitment of teaching staff to teaching (e.g. inter-ruption/ cancellation of teaching sessions)	(O'Brien *et al.* 2007) (Moss *et al.* 1992; Radcliffe *et al.* 2003; Stark 2003; Lempp *et al.* 2004; Seabrook 2004) (Stark 2003; Lempp *et al.* 2004; Seabrook 2004; Dornan *et al.* 2007)
Organisation, observation and feedback	-Insufficient supervision during patient examination or other clinical tasks -Lack of feedback -Perceived poor organisation of teaching	(Prince *et al.* 2000; O'Brien *et al.* 2007) (Milan *et al.* 2011) (Dolmans *et al.* 2008)

What affects transition to clinical learning?

Several research studies focused on factors that influence the students' transition to clinical learning. These factors include: the type of medical training programme; preparation; maturity; and gender.

Training programme

A large portion of these research studies explored the effect of a PBL curriculum on student transition. Prince and colleagues showed that the PBL approach did not enhance the application of basic science concepts to clinical problems (Prince *et al.* 2000; Prince *et al.* 2005). Godefrooij *et al.* showed that early patient contact in a PBL approach increased students' confidence, motivation and clinical reasoning skills and better prepared them for their clinical training (Godefrooij *et al.* 2010). White explored the influence of self-regulated learning on student transition (White 2007). He compared students from a PBL and a traditional learning curriculum and showed that PBL students were accustomed to taking more responsibility and autonomy for their learning and, as a result, experienced an effective transition from classroom to clinical learning.

Expectations and preparation

Since goal setting is conducive to effective learning, Torok *et al.* identified themes of third year medical students' learning goal at the start of clinical training and six months after (Torok *et al.* 2009). The investigators showed that the students' learning goals shifted from basic (e.g. presentation skills, critical thinking) to more advanced skills (e.g. patient management skills) which indicates their increased awareness of learning needs. The study recommends helping transitioning students to formulate specific learning objectives so that they can make the most of their early clinical experiences. Students often reported their anxiety about performing clinical skills and were uncertain about the expectations for level of skill mastery upon entering clinical placement. Wenrich *et al.* compared the perceptions of clinical skills preparation at the beginning of clinical training between students; clinical; and pre-clinical teachers (Wenrich *et al.* 2010). Pre-clinical teachers and students had higher expectations than clinical teachers for the degree of preparation in most basic skills. The authors call for better communications between students and teaching staff to help them understand the standard expected of them. This is expected to facilitate an integrated transition to clinical training.

A number of studies reported the difficulties that students encounter in applying theoretical knowledge and limited clinical skills during the transition period (Table 1). Van Hell *et al.* studied the influence of pre-clinical knowledge and skills on the transition to clinical learning and overall performance (Van Hell *et al.* 2008). In contrast to other studies, the authors showed that pre-clinical knowledge and skills did not influence the perceived difficulty of transition. However, the students' pre-clinical knowledge and skills affected their overall performance in their first clerkship.

Maturity

Hayes *et al.* (Hayes *et al.* 2004) and Shacklady (Shacklady *et al.* 2009) studied the effect of maturity on transition to clinical learning. Hayes *et al.* explored the perceived anxiety to starting clinical attachments between mature graduate (GE) entry students and undergraduate students. GE students felt significantly less anxious and more prepared than their undergraduate colleagues at the transition stage. However, GE students participated in a clinically oriented PBL curriculum as well as an integrated clinical and communications programme, which could account for the differences in addition to maturity. Shacklady compared mature students (over the age of 21) to non-mature colleagues (median age 18) studying the same PBL curriculum. The study showed that mature students were able to draw on their life experiences and were less likely to feel confused or daunted upon entering the clinical environment.

Gender

Babaria *et al.* studied the effect of gender during the transition to clinical learning (Babaria *et al.* 2009). The findings suggest that the transition appears to be more difficult for females who, in addition to the clinical learning curve, encounter a 'gender learning curve'. This term reflects their perceived higher workplace expectations for female physicians. Female students felt that they had to be more serious and had to prove

themselves. Seabrook similarly showed that female students sometimes felt they were not taken as seriously as male students and were often thought of as nurses, by male consultants as well as patients (Seabrook 2004).

What impedes effective teaching in clinical settings?

Many clinicians enjoy teaching students. However, their ability to deliver high quality teaching can be compromised by time and resource limitations. Several studies explored the personal factors and system policies and structures that impact effective teaching in clinical settings.

Seabrook reported findings from 22 interviews with clinical staff affiliated to a London medical school (Seabrook 2003) on their perceptions on teaching in clinical settings. Coady described his observations of clinical teaching in Freemantle Hospital in Newcastle upon Tyne (Coady *et al.* 2003). Hendry *et al.* performed a wider sample study and reported perceptions from 249 consultants involved in teaching all Year 3 students at the University of Birmingham Medical School (Hendry *et al.* 2005) exploring their attitudes with regards to teaching. The three studies highlighted some of the teaching challenges experienced by clinical teachers, as summarised in Table 3. The overarching perception among consultants was that their teaching was not valued by either service trusts or the medical schools.

Parry and colleagues interviewed academic, clinical and administrative staff from three UK medical school (Parry *et al.* 2008). Their study highlights major concerns about teaching capacity in the face of student expansion. In universities, the Research Assessment Exercise (RAE) appears to prioritise research. In the NHS, the tension is not so much between teaching and research but rather between teaching and service delivery. The current performance management agenda demands the explicit demonstration of efficient and effective service delivery. This makes teaching take a lower priority to service delivery and research. Additionally, teaching is often placed as an unspecified activity in the new consultant contracts. The implication is that teaching now requires 'goodwill'; it allows consultants to opt out of teaching, since it is not always part of the job description.

Teachers need to feel supported if they are to provide high quality of clinical teaching. Creating stronger links between hospitals and medicals schools may help to improve communications around teaching and increase opportunities to understand curricular developments and acquire teaching skills. Creating a proper system of rewards for teaching, a formal structure of accountability and monitoring will demonstrate that institutions award teaching the value that it deserves. Current policies should ensure that teaching in suitably incorporated in the job plans of consultants and reviewed as part of their annual appraisal (Lempp *et al.* 2004).

Table 2. Barriers to effective teaching

Barriers	Description	Citation
Lack of time and conflicting priorities	-Changes in junior doctors working hours -Increasing pressure of clinical work -Lack of protected time for teaching	(Coady *et al.* 2003; Seabrook 2003; Hendry *et al.* 2005; Macdonald 2005)
Lack of recognition or reward for teaching	Lack of promotion opportunities based on teaching	(Seabrook 2003; Hendry *et al.* 2005)
Lack of Inclusion or influence	Poor communication with the medical school. NHS doctors wanted more guidance from the medical school and to be more included in the decision making process	(Seabrook 2003)
Limited knowledge and skills about teaching methods.	-Most doctors had no formal educational training	(Coady *et al.* 2003; Seabrook 2003)
Inadequate resources for teaching	-Lack of teaching space -Difficulty in reclaiming financial resources, e.g. travel funds for patients brought for teaching	(Seabrook 2003)
Limited patient opportunities	-Shift in patient care towards short-stay and day-case limit 'interesting' patients -Some patients unwilling to participate in teaching	(Hendry *et al.* 2005)
Perceived inadequacy of student preparation for clinical learning	-Inadequacy of students' basic science knowledge (particularly physiology and anatomy) among students pose teaching challenges -Students unable to self-direct their learning and most are unaware of the requirements of a professional career	(Coady *et al.* 2003; Hendry *et al.* 2005) Hendry *et al.* 2005
Increasing number of students	-Increasing student numbers will likely cause additional challenges with the current lack of teaching time and increasing service commitments.	(Coady *et al.* 2003; Hendry *et al.* 2005; Macdonald 2005
Student no longer belonging to the team	-Shift away from 10-15 week placement with a single firm to a modular basis with attachments to several firms	(Seabrook 2003; Hendry *et al.* 2005)
Poor communication between teachers	-Uncertainty about what students have been taught -Repetition	(Coady *et al.* 2003)

How are transition challenges addressed?

A large number of studies focused on strategies that attempted to ease the transition to pre-clinical learning. For the past decade, many medical universities adopted a PBL approach for at least part of their curriculum in an effort to facilitate students' ability to use theoretical knowledge to solve clinical problems (Kinkade 2005). Most training programmes introduce medical students to the professional skills needed for clinical practice

such as interviewing, physical exam, communication skills and professional responsibility through a skills training course during the first two years of the curriculum (Remmen *et al.* 2001; Rego *et al.* 2009). Many universities recently made other curricular changes including; integrated early clinical experiences (Dornan, Littlewood *et al.* 2006; Yardley *et al.* 2010); transitional courses or orientation to clinical learning (Poncelet *et al.* 2008; O'Brien *et al.* 2010); and longitudinal clinical learning experiences (Hirsh *et al.* 2007). Refer to Table 3 for a summary of the research studies that describe these curricular innovations.

Integrated early clinical experiences

Regulatory bodies such as the General Medical Council (General Medical Council 2009) and Carnegie Foundation for teaching advancement (Irby *et al.* 2010) emphasised the importance of early clinical experience (ECE) in the first years of the medical training to help students learn and develop appropriate attitudes towards their studies and future practice. In the UK, the majority of ECEs are offered through General practice placement (Hopayian *et al.* 2007). Through discussion with students and educational leaders from three UK medical universities, Dornan and Bundy (2004) explored the benefits of ECE in medical education. ECE helped to ease the abrupt transition to clinical environments through: increasing confidence; motivation; deepening and contextualising their theoretical knowledge; orienting them to the social context of practice; and the role of health professionals (Howe *et al.* 2007). Dyrbye found similar findings through analysing second year medical students' reflective journal assays pertaining to their first experiences with inpatients (Dyrbye *et al.* 2007). ECE helped students' professional development by helping them to learn from hospitalised patients; gain clinical skills; apply basic science knowledge; and learn about the physician role.

Many institutions are now taking more innovative approaches to integrate early clinical experiences. Some universities added longitudinal mentoring to provide extra support for students before their transition to clinical learning. Ten US medical universities participated in an Interdisciplinary Generalist Curriculum (IGC) project included early clinical experience programmes as a fundamental part of their training model (O'Brien-Gonzales *et al.* 2001). Preclinical students were placed in community practice settings with one-to-one preceptorships with primary care physicians. Students benefited from developing supportive, long-term relationships with preceptors. Additionally, most universities in this study reported improvement in student performance in clerkships as a result of the ECE, particularly early in the third year. Whipple *et al.* described a similar ECE approach in inpatient, bedside settings where students learned core clinical skills and professional responsibility from a consistent faculty mentor (Whipple *et al.* 2006). This experience improved the students' comfort in core clinical skills at the start the clinical training. Neiman also described ECE through primary care preceptorships and studied its impact on students' clinical skills. The study showed that students who participated in the pre-clinical preceptorship performed better on OSCE compared to students who did not participate (Nieman *et al.* 2006). Alford *et al.* described a less resource-intensive approach to introduce ECE where first year medical students shadowed third year medical students during their clerkships for six half-days, one in each clerkship (Alford *et al.* 2004). In this way, students were exposed to the full range of clinical rotations without teaching pressures and patient care responsibilities.

Transitional courses

Small *et al.* explored the clinical skills that medical students perceived to be the most essential for starting clinical practice (Small 2008). Preclinical students identified the essential clinical skill for clinical placements as: basic clinical data gathering, clinical reasoning and oral case presentations. Clinical students who have experience a year of clinical learning emphasise the importance of time management, interpersonal communications and self-care. Transitional courses are typically organised immediately before the clinical training and provide students with practical knowledge and skills that they need for their first rotation. Poncelet *et al.* described the content and educational approaches of 30 transitional courses offered in US medical universities (Poncelet *et al.* 2008). The authors identified three curricular themes, namely: providing new information and skills; reviewing and applying pre-clinical knowledge; and focusing on student well-being and coping strategies. O'Brien *et al.* performed a national survey of US and Canadian medical universities to characterise the key features of transition course and called for more learning opportunities in real clinical settings, as well as formulating specific objectives to address transition needs and challenges. The authors also recommended focusing on tasks that are more applicable to the students first clerkship and employing

interdisciplinary and near-peer teaching strategies (O'Brien *et al.* 2010). In the next section we describe four different transition course models described recently in the literature that address aspects of the challenges that students associate with transition to clinical rotations.

Chittenden *et al.* at the University of California San Francisco designed their clerkship course based on experiential workplace learning theory to address active participation involving both observing and acting under supervision (Chittenden *et al.* 2009). Their seven day course combined didactics and hospital immersion in the hospital, learning logistics and their role responsibilities and procedural practice. Students had the opportunity to admit inpatients twice, and followed the patient the next day. Although the students had no patient care responsibilities, they received feedback on patient presentations and patient write-ups from dedicated preceptors. The authors showed that the course improved the students' understanding of their roles and increased their confidence prior to the transition to clinical learning.

Another course at the University of Geneva focused on helping students collect information and interpret clinical findings in ways that facilitated diagnosis and management of patients (Van Gessel *et al.* 2003). Students participated in a 12 week unit course that immediately preceded the first clinical rotation. The course was based on a PBL approach where students worked on 24 patient problems selected to introduce basic and common presentations in general surgery, internal medicine, paediatrics, geriatrics and neurology. In addition to problem solving on patient cases, students received instruction on related issues in clinical pharmacology, epidemiology, ethics and basic clinical skills.

Another course focused on assisting students to shift to experiential learning, emphasising goal-oriented active and reflective learning processes (Jacobs *et al.* 2005). Students were provided with a clear description of learning goals and activities at the start of the four-week course. The clinical activities in which students participated on the ward consisted of history taking and physical examinations with at least six patients, followed by formulating diagnosis and therapeutic plans. Students were asked to write clinical experiences in logbooks to encourage reflection. Students participated in formative half-way interviews and a summative final interview with a staff member. Students reflected on learning experiences and received feedback during the first interview. The final interview focused on medical competencies such as communication with patients, professionalism and other specific learning goals.

Chumley *et al.* described a two-week long course that focused on a set of 18 tasks and skills identified as relevant activities commonly performed in clinical rotations. The authors reported an increased the students' self-reported preparedness for the clinical skills after participation the course (Chumley *et al.* 2005).

Longitudinal clinical learning experiences

Recent curricular innovations have challenged the way that clinical rotations are traditionally organised. In this section, we include a number of studies describing changes made to clinical teaching to address student challenges in clinical learning including: coping with the increased workload; adjusting to frequent changes in staff and settings and peer groups; de-contextualised knowledge / lack of integration; self-care and reflection. The traditional clinical training model is based on inpatient, discipline-based block rotations or attachments. Some of these new curricular models feature varying amounts of in- and out-patient experiences, and continuity of patients, staff, settings and peer groups.

Van Hell *et al.* recognised the student challenges associated with high workload during the transition from preclinical to clinical learning (Van Hell *et al.* 2011). Instead of administering skills training longitudinally in the preclinical curriculum, the authors piloted a dual learning year where they alternated clinical skills training and clinical rotations in the first clinical year. This way, students learned new clinical skills in a supportive environment with guiding feedback directly before applying them in real clinical settings. During the subsequent clinical rotation, students applied these skills and gained the necessary clinical experience. At the start of the next skills training, students reflected on their previous clinical learning experience and identified their learning needs. They spent the subsequent skills training working on their own learning needs and learning new skills in preparation for the next clinical rotation. During the dual learning year, student reported

a decrease in their experienced workload and an increase in perceived skill level and decreased perceived stress.

Many universities incorporated elements of education continuity into clinical learning. Some developed interdisciplinary intersessions (Fenton *et al.* 2002). These are generally one week long between block rotations. They provided opportunities for all third year students 'off rotation' to study together in a collaborative and reflective way. Intercessions typically had themes that linked similar content between rotations in an integrative way. Students valued the opportunity to gather together to process their clinical experiences and to use those experiences to drive learning in relevant areas that were inconsistently taught in rotations. O'Neill *et al.* described a new clerkship model at the University of Manchester, where thematically organised problem-based material was taught alongside discipline-specific attachments or block rotations (O'Neill *et al.* 2000). Participating students indicated significant gains in dealing with clinical uncertainty and understanding their own limits. The University of Dundee integrated content across the entire curriculum through PBL. Students used cases from real clinical experience (rather than paper cases) to generate examples of a series of pre-determined tasks. The students were responsible for exploring these tasks and identifying learning opportunities as they moved though the discipline-based attachments (Harden *et al.* 2000). Chou *et al*. described their approach in creating a longitudinal programme based at a Veterans Affairs Medical Centre to enhance peer support through uncomfortable transitions during clerkship rotations (Chou *et al.* 2011). Participating students stayed in the same peer groups across three discipline-specific rotations and attended weekly facilitated mentoring sessions. Students benefited from the continuity of site, patient population, faculty mentorship and peer groups.

The shift of care from inpatient to ambulatory care settings in the US made it necessary to train medical students in these areas. Longitudinal ambulatory clerkships are another model in US medical universities designed individually or collectively by the family medicine, general internal medicine and general paediatrics. Students in longitudinal ambulatory clerkship rotation benefit more contact time with attending preceptors (away from high pressure in patient settings). Students also benefit from experiencing continuity of patient care and understanding the longitudinal management of chronic illness (Ogrinc *et al.* 2002).

Ogur *et al.* described a new model of longitudinal integration of clinical disciplines piloted at Harvard Medical Schools and the Cambridge Health Alliance (Ogur *et al.* 2007). The model was designed to allow students to experience the continuity of care and to learn about patients' whole course and illness and processes of care (Krupat *et al.* 2009). Students spent their entire third year learning from close and continuous contact with a cohort of patients carefully selected from their preceptors' practices in internal medicine, paediatrics, psychiatry, neurology and obstetrics-gynaecology. Students followed their patients through different avenues of care including inpatient settings, outpatients' specialty clinics, rehabilitative, nursing home and home care, mentored by their preceptors. Additionally, students participated in: weekly case-based tutorials to integrate basic and clinical science knowledge; simulation exercises for developing clinical skills; social science curricula that emphasise communication and self-reflection skills; and mentored educational portfolios. In this pilot, participating students expressed more satisfaction with teaching and feedback and performed equally well on content knowledge and skills compared to traditional block students. This model has since been adopted in other universities.

Table 3. Summary of Curricular innovations addressing student transition challenges

Learning experience	Transition challenge addressed	Study citation
Early clinical experience	Consistent mentoring	(O'Brien-Gonzales *et al.* 2001; Whipple *et al.* 2006)
	Comfort with clinical skills	(Nieman *et al.* 2006)
	Exposure to inpatient settings without teaching pressures	(Alford *et al.* 2004)
Transition courses	Familiarisation with clinical setting and receiving feedback on clinical skills	(Chittenden *et al.* 2009)
	Developing clinical reasoning skills	(Van Gessel *et al.* 2003)
	Shifting to active and reflective learning	(Jacobs *et al.* 2005)
	Improving core clinical skills	(Chumley 2005)
Longitudinal clinical learning	Coping with the increased workload	(Van Hell *et al.* 2011)
	Integrating of de-contextualised and discipline-based knowledge	(Harden *et al.* 2000; O'Neill *et al.* 2000; Fenton *et al.* 2002)
	Peer-support and reflection	(Chou *et al.* 2011)
	Continuity of patient care and setting	(Ogrinc *et al.* 2002; Ogur *et al.* 2007; Krupat *et al.* 2009)

Models for experience-based learning

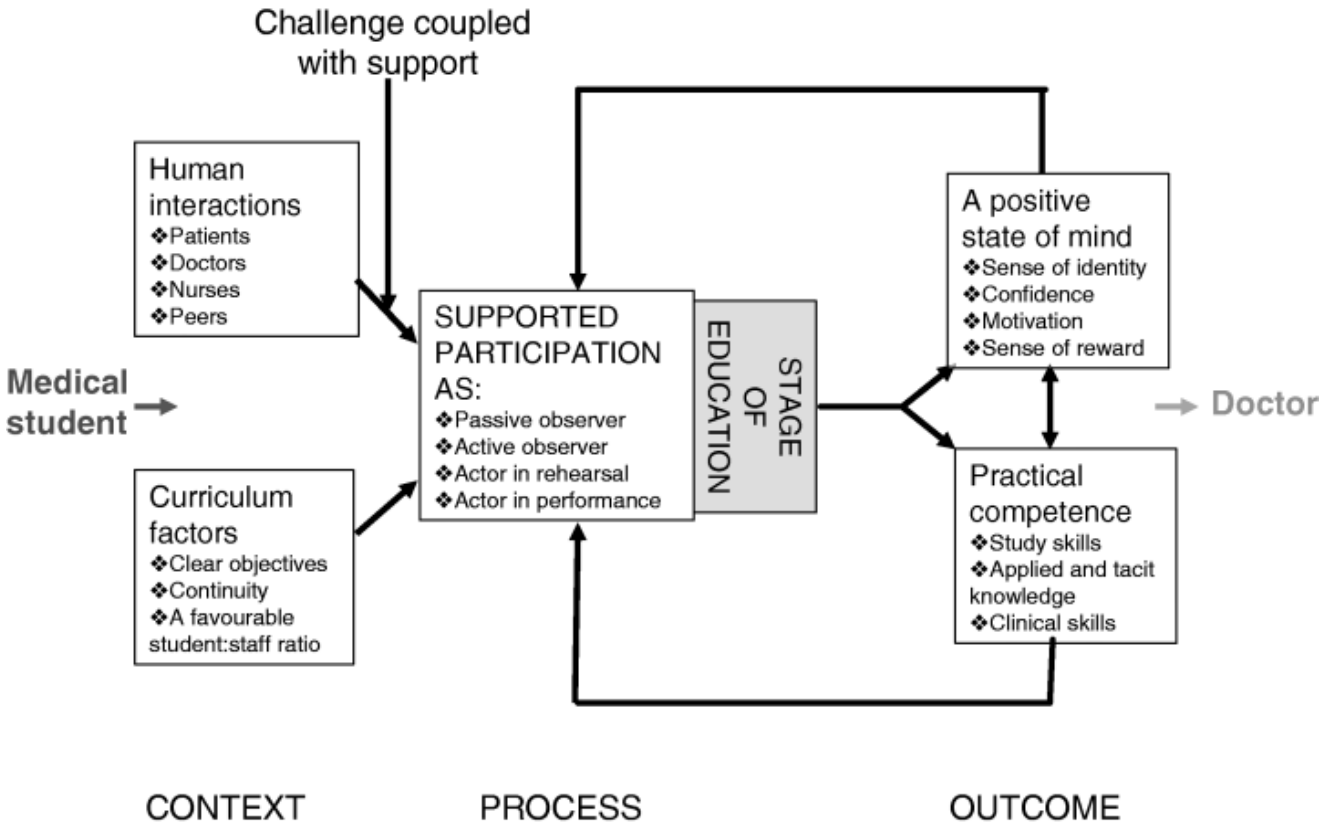
In this section, we describe three models that relate to work-based learning theory in clinical settings. Workplace learning theory indicates that learners must participate in an authentic context and need to feel welcomed into the clinical team. The clinical learning climate is believed to influence the learners' behaviours and predict satisfaction and success.

Dornan and colleagues emphasised the importance of supported participation in clinical learning (Dornan *et al.* 2007). The education climate and teaching behaviours that support and challenge learners can increase the learners' participation. By participating, learners develop practical competencies (study skills and clinical skills) and an appropriate state of mind (confidence, professional identity and motivation). The model (shown in Figure 1) shows how participation is central to student learning and is shaped by human interactions (patients, staff, peers) and curriculum factors (clear objectives, continuity, and supervision).

Boor and colleagues were interested in the differences between learning climates and identified factors that explain these variations (Boor *et al.* 2008). The authors analysed medical students' perspectives on their experiences of two different learning climates. Their findings showed that participation is a key factor in an effective clinical learning climate. Participation involves institutional factors (encouragement) and student factors (proactivity and willingness to engage).

Pearson and Lucas developed a model where clinical learning occurs through engagement and opportunity (Pearson *et al.* 2011).Their case study finding shows that engagement develops from recognition (feeling welcomed, seen as an individual); respect (through high quality of teaching and patient care); relevance (teaching that is aligned with curriculum and expectations); and emotion (teacher enthusiasm and challenge). Learners valued opportunities for learning from meaningful patient encounters alongside interactions with supportive and stimulating peers and professional colleagues.

Figure 1 Model linking processes and outcomes of medical students' workplace learning (from Dornan, Boshuizen *et al.* 2007)



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The Higher Education Academy
Innovation Way
York Science Park
Heslington
York YO10 5BR

http://www.heacademy.ac.uk/resources/detail/ntfs/ntfs-projects

Tel: +44 (0)1904 717500
Fax: +44 (0)1904 717505