

Early Learner Engagement in the Clinical Workplace

Huiju Carrie Chen

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Chapter 1

Introduction

The main goal of this thesis is to understand and improve the engagement of early learners in the clinical workplace. At each stage of medical training, we want our learners to arrive ready to function and contribute as a member of the clinical workplace; yet we can be reluctant and unsure of how to incorporate them in the workplace prior to each of these steps to prepare them for subsequent roles and activities. Using Dornan's language for levels of learner participation, we want actors in performance without allowing actors in rehearsal.¹ This is especially manifest for early learners.

This chapter provides a general overview of clinical workplace experiences for early learners, including definitions, the historical perspective and trends, as well as challenges with implementation. It reviews what is known about learning in the workplace, recent conceptualizations of workplace activities for learners, and identifies gaps in the literature. Finally, it introduces the body of work that comprises this thesis and outlines the upcoming chapters.

EARLY CLINICAL EXPERIENCES

Definitions

For the purposes of this thesis, early clinical experiences are defined as experiences related to the care of actual patients in the clinical workplace for early learners. Ideally, these experiences are authentic in that they include meaningful and purposeful activities which contribute to the care of patients. Early learners are students in their initial years of the medical training, where the curriculum is primarily classroom-based or pre-clinical. Typically, this includes the first three to four years of undergraduate medical education in most countries, and the first two years in the United States and Canada. This definition is consistent with the definition Yardley and colleagues used in describing learning from early experience in practice. "Early experience describes students engaging in authentic workplace contexts from the start of their medical studies."²

Historical Perspective and Trends

In much of the 1700's the study of medicine in Europe was similar across countries and based largely in universities, where the focus was on classic writings rather than the practical hands-on care of patients. In the early 1800's experiments with training physicians in hospitals and other locations outside of the university took root in multiple countries resulting in a mix of elite university-educated physicians and apprentice- and hospital-trained practitioners. By the late 1800's, in all European and North American countries except Germany, most medical study was located outside the university and poorly regulated.³ Similarly, in 1910, Abraham Flexner issued a report on medical schools in the United States and Canada, criticizing the lack of medical education standards and the resulting highly variable physician performance. He proposed a four year medical degree with two years of university-based medical school followed by two years of supervised clinical experiences in a teaching hospital.⁴

In North America and elsewhere, Flexner's model of classroom-based didactic instruction followed by experiential learning in the clinical setting has defined medical education over the last century. Early learners in this model have little exposure and access to the clinical setting. Over the last couple of decades, medical schools in various countries have begun adding clinical experiences into the early classroom-based curriculum.⁵⁻⁷ These experiences help students acquire knowledge, provide relevance for their classroom learning, and support their identity formation and socialization into the profession.^{4,6-10} Regulatory and professional bodies have therefore encouraged the incorporation of early clinical workplace experiences.^{5,7,11} In addition, recent calls for medical education reform have advocated for curricular designs which better integrate and connect didactic knowledge with experiential learning.⁴ This new vision of medical education changes the current relationship between learners and patient care; it moves from the current model of exposure and eventual participation to one of active learner engagement throughout medical education. It defines learner activities in actual patient care from the very beginning of medical training and blurs the traditional line between the pre-clinical classroom-based and clinical experience-based curricula.⁴

Challenges with Implementation

Increasingly, medical schools have incorporated early clinical experiences into their curricula; however, they vary greatly in structure, curricular goals, and the amount of contact time with real patients in clinical settings.^{5,7,12} Curricular goals range from improving understanding of patient perspectives and the social context of illness to the development of interpersonal and communication skills to the acquisition of clinical knowledge and core clinical skills.^{7,12} Many schools conceive of early clinical experiences as a strategy for easing the transition of early learners to the later years of the curriculum. These schools acknowledge and maintain the pre-clinical and clinical divide in their curriculum. Only a minority of schools use early clinical experiences as a strategy for improving integration between the classroom-based and experiential-based curricula as recommended by Cooke and colleagues.^{4,12} As a result early clinical experiences remain largely experiences of observation and exposure rather than ones of active learner engagement.^{5,7,12}

There are challenges to providing early clinical experiences that allow active learner engagement. These include finding appropriate roles and activities for early learners in the workplace; gaining understanding and acceptance among learners and supervisors of these learner roles and activities; providing in-situ support for learners to undertake them; and managing the risk involved in learner participation in the clinical workplace.¹³ The increase in prevalence of sicker patients with more complex health problems and in the emphasis on quality and safety have decreased the patient care roles and activities available to early learners.^{14,15} Perhaps not surprisingly then, supervising residents and faculty members are less enthusiastic than learners about early clinical experiences, noting a need for the learners to gain additional medical knowledge and clinical skills before entering the workplace.¹⁶

LEARNING IN THE WORKPLACE

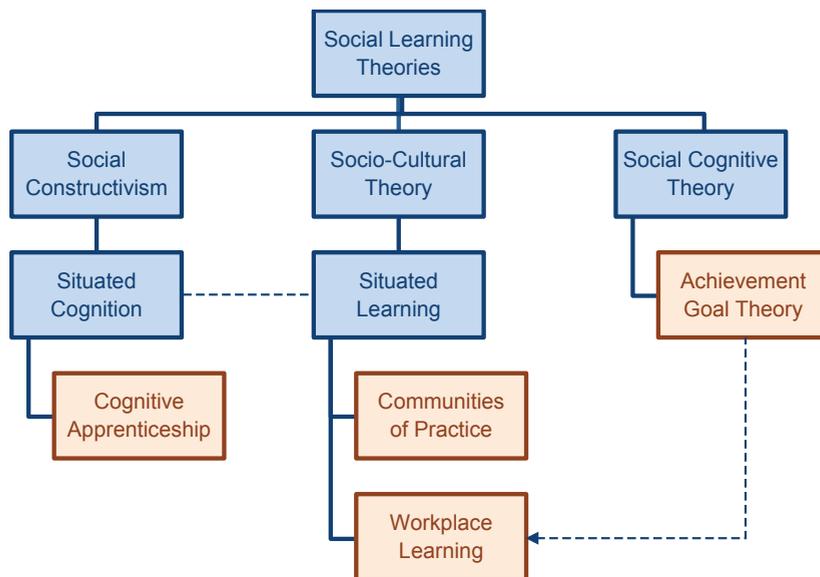
To address the challenges of learner engagement in early clinical experiences, it is important to frame these experiences around and consider the principles of learning in the workplace. For most of human history, learning has occurred outside of the classroom, and in the trades and professions, the workplace has been the site of learning.^{17,18} Since medieval times, much on-the-job learning in the trades and professions occurred through apprenticeships.² In apprenticeships, the knowledge and psychomotor skills needed for the trade or profession are acquired through the observation of, coaching by, and practice with experts.¹⁸ Learning about work arises out of the work itself, and learning can be conceptualized as participation. In both undergraduate and graduate medical education, apprenticeships were and remain a pervasive method of learning; learners are placed in clinical settings to perform and learn from the work of the clinical workplace.^{19,20}

A number of theories and frameworks can be used to understand learning in the workplace. Most are rooted in the social learning theories of situated cognition and situated learning, which acknowledge the interplay between learners and their environment, and put equal emphasis on both.²¹ From these theories come the frameworks of cognitive apprenticeship, communities of practice, and workplace learning, which are particularly helpful for looking at the interaction of learners with supervisors and the environment. In addition, social cognitive and achievement goal theory provide further context for understanding the learner's role in workplace learning. See Figure 1. Together, cognitive apprenticeship, communities of practice, workplace learning, and achievement goal theory, provide a broad and socially embedded perspective of learning in the workplace. They allow examinations in turn of the contributing roles of the supervisor, the workplace community, the workplace environment, and the learner to the learning interactions and activities within the workplace.

Situated Cognition and Situated Learning

Situated cognition comes from the constructivist perspective which argues that thinking and learning is situated or located within and cannot be divorced from the physical and social context in which it occurs.²² It takes into account the learning activities, the contexts in which these activities are undertaken, and the many processes that interact to produce learning. It argues that learning should occur in the context in which knowledge and skills will be used in order to facilitate transfer. Also, learners are able to transfer learning from one context to another when they understand the context in which the learning occurred and its applicability to other contexts.²¹ Situated cognition has been used to explore cognition in different learning contexts, including the workplace and in learning situations such as apprenticeships.²²

Situated learning, which has a socio-cultural basis, includes the principles of situated cognition, and some consider situated learning to be one component of situated cognition.²⁰⁻²² Situated learning was initially used to study the learning in apprenticeships.²³ It argues that learning is social in nature and occurs through interactions with others and the environment.

Figure 1: Theories and Frameworks for Understanding Learning in the Workplace

Blue boxes indicate overarching theories or perspectives

Orange boxes indicate theories or frameworks that were applied to the thesis research

Situated cognition is related to situated learning

Achievement goal theory can be used to understand learner agency in workplace learning

Learning is a product of the activity, context, and culture in which the activity occurs. Through the process of learning, both the learner and the environment, through the impact of the learner on his/her environment are changed.²³

Cognitive Apprenticeship

Through the lens of situated cognition, apprentices acquire the necessary skills and become enculturated for a profession through participation in authentic work activities and social interaction.²⁴ In the traditional apprenticeship model, it is assumed that apprentices will learn all that is necessary for the job by engaging in the work of the workplace. Yet the primary elements of learning in apprenticeships can be random, opportunistic and covert, and learning just by doing, without appropriate guidance or support, can be insufficient, particularly for complex professional practice.¹⁷

In response, Allan Collins proposed the cognitive apprenticeship model, a variation on the traditional apprenticeship model to provide structure and allow for a more deliberate teaching curriculum. Collins' cognitive apprenticeship focuses on the development of cognitive skills, in addition to the knowledge and psychomotor skills, required for complex areas of professional practice. It deviates from the traditional apprenticeship in that 1) task or activities are chosen for learners based on learning considerations as well as the needs of the

workplace, and 2) teaching emphasizes generalizing knowledge and skills beyond the initial context for application to varied situations.¹⁸

Building on principles from situated cognition, Collins describes four dimensions of the cognitive apprenticeship¹⁸:

1. Content, including learning tasks and activities, metacognitive skills, and cultural processes, required for expertise,
2. Teaching methods, including guidance and support, to promote participation, learning and transfer,
3. Sequence of learning tasks and activities, and
4. The social characteristics or real world-context that impact learning.

The cognitive apprenticeship model has been applied to medical education. In particular, the teaching methods outlined by Collins have proven to be a helpful concept for understanding teaching and learning in the clinical workplace.^{25,26}

Communities of Practice

In the traditional and cognitive apprenticeship models, the focus is primarily on *learning-as-acquisition*.²⁷ Attention is placed on the teaching curriculum, the teacher-learner relationship and the impact of this relationship on the development of the learner, which is mediated by the real-world context of the workplace. These apprenticeship models do not consider that the teacher may learn from the learner or that the learner may shape the work in which both are engaged. More contemporary views of learning in the workplace include a socio-cultural perspective that addresses the reciprocal nature of learning between the teacher and learner as well as the contributions made by others in the workplace.²⁰ This includes a shift towards *learning-as-participation*. Emphasis moves from teaching (and learning) *about* and *for* work to learning *in* and *through* supported participation in work, and an attention to the learning curriculum.²⁷

From the perspective of situated learning, Lave and Wenger argue that opportunities for learning in apprenticeships are more often structured by the work practices within a community and the learner's relationship with others in the community than by the teacher. They describe learning as an activity where learners are situated and participate in communities of practitioners and where learning arises from acts of social participation.²³ A community of practice is a group of individuals who share a common goal and who share and develop a repertoire of common language, knowledge, beliefs, values, stories, and practices to achieve that goal.^{23,28}

Learners, as new entrants to the workplace and its community of practice, gain knowledge, skills, and habits necessary to become full participants and members of the community by engaging in the activities and practices of the community. Newcomers initially engage in peripheral yet legitimate activities of the workplace. Legitimate activities are those that make meaningful and valued contributions to the community of practice. This legitimate peripheral

participation moves in a centripetal trajectory until the learners' knowledge, skills, and habits have progressed to allow full participation and membership in the community of practice. The nature and extent of learning depends on the learner's ability to make meaningful and valued contributions through their legitimate peripheral participation.²³

Egan and Jaye apply this communities of practice framework to the healthcare setting to talk about the communities of clinical practice and learner roles within those communities.²⁹ Others also use this framework to understand the experiences of medical students, residents, and faculty members in the clinical workplace.^{27,30-34}

Workplace Learning

In his conception of workplace learning, Billett also emphasizes learning as participation. He argues that the richness of learning in the workplace depends on the interactions and activities in which learners participate and the degree of learner engagement in these interactions/activities.¹⁷ His framework of the workplace as a learning environment is similar to Lave and Wenger's community of practice, in that the workplace has the ability to structure and regulate learner participation.^{17,23} It can either invite learner participation and sequence activities to support the participation of learners at different readiness-to-participate levels or deny learners access to activities and interactions. Workplaces differ in their workplace *affordances*, or the situational factors (types of activities, interpersonal dynamics, rules, and cultural practices), that invite and support learner participation.^{17,35} However, workplace affordances represent only one dimension of workplace learning and are not the only determinants of learner participation.

The second dimension is the learners. Learners are not passive and can choose whether to engage, in which activities or interactions to engage, and their degree of engagement. They determine how and what they learn.¹⁷ Some learners are more agentic, setting out to learn actively and enthusiastically, than others who may be reluctant and grudging in their participation. Learner *agency* determines how learners construe the affordances of the workplace. In turn, workplace affordances likely also influence learner willingness both to engage in activities and seek guidance from others in the workplace to support their participation.³⁵

Workplace learning, therefore, represents an interaction between the *affordances* of the workplace and the learner's *agency*. The workplace is a learning environment that is negotiated by the learner and mediated by the practices of the workplace. Efforts to ensure that learners are welcomed and that their participation is actively supported do not guarantee learner participation.³⁵ Therefore, it becomes important to consider learner agency or the learner's motivations, intentions, and resultant behaviors.

Social Cognitive Theory

To understand the learner's motivations/intentions and behavior in the workplace, it is helpful to include another theoretical perspective, that of social cognitive theory. Social cognitive

theory regards learners as active agents in their own learning. Learner behavior and behavior change is influenced by personal goals, attitudes, values, knowledge, and experiences, as well as the interactions between the learner and his/her environment.³⁶ Bandura suggests that people's motivations and behaviors are rooted in their sense of personal agency, their belief in their ability to produce effects with their actions. However outcomes may only partly be a result of an individual's agentic actions; environmental factors such as the involvement of other people may impact outcomes. Therefore, learners judge their capabilities, anticipate consequences of different actions, assess the social and structural situation, and regulate their behaviors accordingly in response to the environment.³⁶

Personal agency in relation to a specific task is perceived self-efficacy. Perceived self-efficacy influences learner's choice of activities and the regulation of their behaviors around those chosen activities. Bandura describes four factors affecting self-efficacy: experience of mastery, vicarious experience (e.g. belief in one's ability based on ability of one's peers), social persuasion, and physiologic factors.³⁷ The two most influential factors are the learner's experience of mastery or whether attempts at the activity result in a successful outcome, and the learner's vicarious experience through the outcome of others attempting the activity.³⁸ Of the different social cognitive models of motivation, achievement goal theory addresses both motivation and behavior, and incorporates these latter two most influential aspects of self-efficacy.

Achievement Goal Theory

Often used to look at academic achievement, achievement goal theory focuses on intermediate level goals, which are goals that extend beyond a specific task (e.g. successful insertion of an intravenous line) but are smaller than those that apply more globally to multiple aspects of life (e.g. belonging to a group). Achievement goal theory integrates a learner's general reasons for achievement and his/her criteria for successful performance into a unified construct that accounts for the learner's approach and engagement in activities and their evaluation of their performance in the activity.³⁹

Individuals in learning situations can have one of three achievement goal orientations that provide a general focus or purpose for achievement. These three types include mastery, performance-approach, and performance-avoid goal orientations. In mastery goal orientation, the goal is to achieve competence or mastery. A learner defines his/her success in relation to the activity. The goal in performance-approach and performance-avoid goal orientations is to demonstrate competence in relation to others. Learners with performance-approach goal orientations strive to appear capable by outperforming others. Those with performance-avoid goal orientations, avoid failing or appearing incapable in comparison to others.⁴⁰

Learners' achievement goal orientations are associated with learner, including medical student, behaviors and relate to achievement and academic outcomes.⁴⁰⁻⁴² A mastery goal oriented learner, focused on learning new skills and unconcerned about the consequences of potential failure, will likely enthusiastically engage in new activities. Through the lens of

workplace learning, the learner exhibits agentic behavior, allowing robust engagement in workplace activities and therefore improved learning outcomes. In contrast, a performance-avoid oriented student, determined not to look incompetent, will likely be reluctant to participate in new activities. This lack of learner agency prevents the degree of participation required for optimal learning.

Learner adoption of a particular goal orientation is influenced by the learning context or the environmental messages and cues about the purposes for engaging in the learning activity.⁴⁰ Goal orientation can be thought of as a learner state that is sensitive to curricular goals and instructional strategies rather than a learner trait that is stable across all learning situations.³⁹

Summary of Frameworks and Theories

In summary, learners work with supervisors who can choose and structure workplace activities to maximize participation and learning. However, they do not merely work with supervisors; they join communities of practice, which have rules and customs that govern newcomer participation. As newcomers engage in legitimate peripheral participation which contributes meaningfully to the work of the workplace, they gain membership in the community. Workplaces vary in their affordances, which can facilitate or impede learner participation in these legitimate peripheral activities. Learners also are active agents who modulate their engagement based on personal goal orientations and their perceptions of the workplace affordances.

WORKPLACE ACTIVITIES FOR LEARNERS

While the frameworks and theories above provide a useful context for thinking about the learning environment and the learners in relation to the environment, they are limited in applicability to descriptions of learner activities. For learners to engage in legitimate peripheral participation, clinical communities of practice need to have defined roles and activities for the learners and trust in the learners' abilities to participate accordingly. It is also important that all members of the community (nurses and other health professionals as well as more senior learners and faculty members) share a common understanding of learner competencies and appropriate activities for each level of learner. An attractive framework for defining the abilities of learners in relation to their participation in workplace activities is that of entrustable professional activities.

Entrustable Professional Activities

The concept of entrustable professional activities (EPAs) places learner abilities or competencies in the context of workplace practice and accounts for the interplay between a learner and his/her environment. Here competencies are defined by starting with the concrete activities a physician performs and then working backwards to link these activities to competency domains. The definition of an EPA is that it is a part of essential professional work for a qualified individual that requires integration of specific knowledge, skills, and

attitudes that are generally acquired through training. It leads to a recognized output that is observable and measurable, and which in turn leads to a concluding decision about whether the activity was done well or not. Each EPA reflects the competencies and all the EPAs together constitute the core of the profession.⁴³

EPAs ground competencies in the everyday tasks of physicians and is aligned with how members of clinical communities of practice interact with learners. Decisions about competence or readiness to participate are based on the community's everyday encounters with the learner, where members make ad-hoc but deliberate decisions about trust for concrete activities. Competence is reached when the professional activity is mastered at a threshold level that permits unsupervised practice and full entrustment. These professional activities may be sequenced in a centripetal trajectory whereupon achievement of entrustment in final level activities confers full participation and membership in the community of practice.

EPAs may be particularly helpful in engaging early medical students in the activities of the workplace. Diverse community members need to know when and how they may invite students into their communities of practice. Certification of student attainment of entrustment for specific activities that contribute to patient care can signal to the community that the student is ready for legitimate peripheral participation. At the same time, EPAs may help clarify for students, their roles in the workplace and how they can contribute meaningfully to the delivery of patient care.

THEORY TO PRACTICE: CHALLENGES AND QUESTIONS

In summary, participation is key to learning in the workplace. The workplace can be viewed as a community of practice. Early learners are newcomers to this community of practice. They identify with, gain membership in, and contribute to the community by engaging in legitimate peripheral activities. The ability of early learners to engage in these workplace activities is mediated by both the affordances of the workplace and the learner's agency. Direct supervisors in the workplace can contribute to the affordances of the workplace and help promote learner participation by choosing appropriate activities and providing the needed support and guidance to allow learner engagement in these legitimate peripheral activities. However, direct supervisors are not the only community members who can facilitate or block learner participation. Defining legitimate peripheral activities that can be entrusted to early learners may be helpful in ensuring shared mental models for early learner participation among community members, including the learners themselves.

To realize the vision of a truly integrated medical curriculum with active learner engagement in authentic patient care experiences throughout medical education, the current engagement of early learners in the clinical workplace needs to be improved. Ideally, clinical communities of practice would entrust certain legitimate peripheral patient care activities to early learners. The published literature on entrustable professional activities (EPAs) relates

primarily to graduate medical training.⁴⁴⁻⁵² EPAs have been used to successfully structure the workplace curriculum for physician assistant training in the Netherlands⁵³ suggesting that they may be applicable to the workplace curriculum for undergraduate medical education. However, there is no literature supporting the application of EPAs to early learners.

It is also unclear what legitimate patient care roles and activities early learners might be capable of assuming and whether these activities could be entrusted to the early learners. From the reported descriptions of early clinical experiences, many schools do not provide early learners with roles beyond that of the observer, and patient care activities when present (patient interviews) may not be legitimate in contributing to the care of the patient.^{5,7,12} These variations in learner roles and activities may be due to either true limitations in learner capabilities or limitations imposed by supervising faculty members or clinical workplaces due to concerns about learner readiness and patient safety.¹⁴⁻¹⁶

In addition to clarifying legitimate peripheral activities for early learners for the clinical community of practice, the issues of workplace affordances and learner agency need to be addressed to ensure learner achievement of these activities. Considerations of the affordances of the clinical workplace include both the structure of the clinical setting and the support and guidance provided by supervising clinicians. Studies on clinical teaching have primarily focused on teacher characteristics such as knowledge or enthusiasm or on general teaching skills or strategies such as feedback skills or modeling.^{25,54-57} There is limited knowledge of whether or how supervising clinicians structure and sequence clinical learning activities to ensure participation by learners at different levels of readiness.

Motivation, defined broadly and viewed through a variety of frameworks, can impact learner behavior, learning, and performance both in general education and in medical education.⁵⁸⁻⁶¹ However, the evidence for correlation of learner motivation with clinical performance outcomes is mixed.⁵⁹ In the clinical setting where participation is important for learning, it may be more helpful to examine learner agency using theories such as achievement goal orientation, which address both learner motivation and learner behaviors and account for the social nature of learning. It has been shown that first-year medical students are primarily mastery goal oriented in relation to a doctor-patient communication course and that their goal orientation is correlated with their experience of the course.⁴² Also medical students who perceive a mastery goal oriented learning environment perform better on clinical rotations.⁴¹ However, it is not known what the achievement goal orientations are of early medical students in relation to clinical workplace experiences and how their goal orientations impact their engagement and learning in the workplace and subsequent performance.

THESIS OUTLINE

This thesis attempts to answer the following questions:

1. Can the concept of entrustable professional activities (EPAs) be applied to early learners?

2. What would be the EPAs for early learners? What legitimate roles and activities are early learners capable of assuming in the workplace?
3. What supports are necessary to enable achievement of early learner EPAs? What are the environmental, teacher, and learner elements needed to support early learner participation in the clinical workplace?

Chapter 2 addresses the question of whether the concept of entrustable professional activities (EPAs) can be applied to undergraduate medical education (UME). It considers continuity and developmental progression of learners across undergraduate and graduate medical education in the context of competency-based medical education, the generalizability of core EPA principles, and the advantages of recognition and quality assurance of medical student work. It also outlines what UME EPAs might look like and considers the applicability of the currently recommended entrustment scale for UME learners.

Chapter 3 presents a constructivist grounded theory interview study which aims to determine what clinical workplace roles and activities early learners are capable of assuming. To avoid limiting student capabilities to those defined by the current curriculum, the roles and activities of first and second-year medical student volunteers in four student-run clinics are explored. Both student volunteers and the clinics' faculty advisors are interviewed. The sensitizing concepts of communities of practice and workplace learning are used in the thematic analysis of the interview data.

Chapter 4 describes the development process, including the collection of content validity evidence for a set of entrustable professional activities (EPAs) for early learners. A multi-step approach is undertaken which includes identification of content or activity domains from student and faculty interviews, including study data from Chapter 3; mapping of the domains to course objectives, graduation competencies, and GME-level EPAs; development of full EPA descriptions; and collection of content validity evidence through local, national, and international workshops with medical educators.

Chapters 5, 6, and 7 explore the question of what elements need to be in place to support learner achievement of early learner EPAs.

Chapters 5 and 6 examine the teaching practices of supervising clinicians via interviews with clinicians identified as excellent clinical teachers. Both studies employ a constructivist grounded theory approach. The first study (Chapter 5) focuses on how excellent clinical teachers select clinical learning activities to support the workplace participation and development of different level learners. The cognitive apprenticeship framework is applied in the thematic analysis of the data. The second study (Chapter 6) investigates how excellent clinical teachers develop their skills to work with different level learners and considers the faculty development needs of supervising clinicians.

Chapter 7 presents a multi-institutional prospective correlational study investigating the relationship among students' achievement goal orientations towards their early clinical

experiences, their perceptions of clinical workplace affordances, and their clinical performance outcomes. Based on the model of workplace learning, survey and performance outcome data from four schools are analyzed using mediation analysis to examine the impact of learner goal orientation on performance outcomes, mediated by their perceptions of the workplace affordances.

Finally, in Chapter 8, the findings from each study are summarized and discussed. Implications and recommendations for the implementation of clinical workplace experiences for early learners as well as future research directions are described.

Note: This thesis is a collection of related articles. Each chapter was written as a stand-alone article. Therefore, repetition and overlap across chapters are expected.

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Chapter 2

The Case for Use of Entrustable Professional Activities in Undergraduate Medical Education

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ABSTRACT

Many graduate medical education (GME) programs have started to consider and adopt entrustable professional activities (EPAs) in their competency frameworks. Do EPAs also have a place in undergraduate medical education (UME)? In this Perspective article, the authors discuss arguments in favor of the use of EPAs in UME. A competency framework that aligns UME and GME outcome expectations would allow for better integration across the educational continuum. The EPA approach would be consistent with what is known about progressive skill development. The key principles underlying EPAs, workplace learning and trust, are generalizable and would also be applicable to UME learners. Lastly, EPAs could increase transparency in the workplace regarding student abilities and help ensure safe and quality patient care. The authors also outline what UME EPAs might look like, suggesting core, specialty-specific, and elective EPAs related to core clinical residency entry expectations and learner interest. UME EPAs would be defined as essential health care activities with which one would expect to entrust a resident at the beginning of residency to perform without direct supervision. Finally, the authors recommend a refinement and expansion of the entrustment and supervision scale previously developed for GME to better incorporate the supervision expectations for UME learners. They suggest that EPAs could be operationalized for UME if UME-specific EPAs were developed and the entrustment scale were expanded.

INTRODUCTION

The Association of American Medical Colleges (AAMC) recently published a draft set of thirteen core entrustable professional activities (EPAs) for entering residency and encouraged medical schools to consider them in determining outcomes for graduating students.¹ The AAMC has been soliciting and receiving feedback on the nature or descriptions of the particular EPAs that were chosen.² Separate from the issue of whether the published EPAs are the right ones,² many might question the theoretical and practical rationales for the use of EPAs in undergraduate medical education (UME). Reasons range from whether workplace activities are an appropriate framework for medical school outcomes to whether entrustment for unsupervised practice applies to students. We propose to provide a context and present arguments for how we might think about EPAs for UME, both in considering and expanding upon the work of the AAMC.

The idea of an outcomes-based approach to curricular design and implementation as well as learner assessment and curriculum development has been proposed in medicine since the 1970s, and has gained increasing attention since the 1990s.³ This international movement towards greater emphasis on learner outcomes is known more widely as competency-based medical education (CBME) and is compelling the delineation of clearer performance expectations for graduates of medical training.^{3,4} A variety of CBME frameworks have been adopted for graduate medical education (GME) in multiple countries including the United States, Canada, the United Kingdom, Sweden, Australia, and the Netherlands.⁵ Despite its growing adoption, significant controversies remain.^{3,4} One concern of educators is that the adopted CBME frameworks, such as the Accreditation Council for Graduate Medical Education (ACGME) core competency domains in the United States, do not fully capture or focus on the actual performance outcome of caring for patients.³⁻⁸ These authors argue that the parts, or the abilities within individual competency domains, do not add up to the whole of practice.⁴ Mastery of abilities in individual competency domains does not ensure the capability to integrate them across domains or to appropriately apply them to patient care. Also, the capability to provide patient care in one context or clinical circumstance may not necessarily translate to other contexts and circumstances. Lastly, the focus on objective assessment of measurable learner abilities may detract attention from the assessment of how learners actually care for their patients in a variety of clinical contexts. Educators have argued that performance outcomes should be framed in the context of clinical care, recognizing that professional development requires the integration of abilities across multiple competency domains and application within the health care environment.^{3,6,8-10} The concept of EPAs, a relatively new CBME-related framework, was introduced as a potential solution to these concerns.^{9,11}

EPAs operationalize medical education outcomes as essential professional activities that one entrusts a professional to perform.¹² An example of such an activity is “care of complicated pregnancies.”⁵ Each EPA is a synthesis of multiple competency domains (e.g. medical knowledge, communication skills, and professionalism) and requires the integration of knowledge, skills, and attitudes.¹² Whereas traditional competency frameworks focus on

qualities of the person, EPAs focus on qualities of the work to be completed.⁵ EPAs therefore ground outcomes in the tasks of physicians and offer an approach to CBME that better addresses concerns around integration of competency domains and context than previous CBME frameworks. In the Netherlands, EPAs have been used successfully as a blueprint for obstetrics and gynecology GME and physician assistant training programs.^{5,13} EPAs for GME training in psychiatry have been implemented in Australia and New Zealand.^{14,15} Similar to other CBME frameworks, EPAs have primarily been applied to GME. The International CBME collaborators have suggested that we work backwards from GME competency expectations to build necessary competency expectations for UME as well.¹⁶ The question arises as to whether working backwards is the right approach. To consider this question we must ask even a more fundamental question: Can EPAs work as a competency framework for UME? We answer that question by addressing whether EPAs are appropriate for UME, what UME EPAs would look like, and what entrustment in UME means.

ARE EPAS APPROPRIATE FOR UME?

We believe the answer is yes; EPAs do have a place in and can be advantageous for UME. Our arguments for the suitability of EPAs will center on the continuity and developmental progression of learners, the generalizability and applicability across the continuum of the principles underlying EPAs, and the recognition and quality assurance of student work in the clinical workplace.

Continuity and Developmental Progression of Learners

The end of medical school can be seen as the completion of a specific training period with its own competency expectations. In reality, medical school completion is just one point along the continuum of physician training.¹⁷ Medical school prepares and provides learners with generic knowledge and skills to support the continued development of more advanced and additional specialty-specific knowledge and skills in GME. Learners develop progressive proficiency along the continuum from UME to GME training. To reach the true potential of CBME, we need to think about operationalizing expectations across the entire continuum. Medical education curricula and learner expectations at each level should build progressively upon previous levels, ideally demonstrate spiral (e.g., iterative and increasing) development of concepts and skills, and be related parts of a comprehensive system.¹⁶ Application of the same competency framework in both UME and GME training would promote this type of vertical integration across the continuum and foster true CBME. For instance, the AAMC is working with four institutions to pilot a competency-based pediatrics training program that will span the UME/GME continuum and employ competency-based rather than time-based advancement. For this pilot, an important early step was to adopt one unifying competency framework that would span the continuum.¹⁸ The use of a unifying framework allows better alignment of educational activities and a consistent approach to achievement-based progression throughout the pilot UME/GME training program.

From a developmental perspective, the EPA approach can work well as a unifying competency framework for UME and GME. As previously described by Ten Cate and colleagues, the entrustment decisions as operationalized in the EPA approach align with the Dreyfus and Dreyfus model for the development of expertise and with the developmental curves described in medical skill development.¹⁹ Using the stages of Dreyfus and Dreyfus, learners would begin as novices for most skills or activities and progress at individual rates during their professional training through the advanced beginner stage to reach the competent stage. Regardless of learner level, the point at which the learner reaches the competent stage for any given activity would correspond to the point at which the learner would be entrusted to perform that professional activity unsupervised.

Generalizability and Applicability of EPA Principles

As noted above, EPAs are essential professional or workplace activities that one entrusts a professional to perform.¹² The key principles that underlie the EPA concept, workplace learning and trust, are generalizable to the continuum of physician training. Both apply to UME as well as GME.

Workplace learning, defined as experiential learning through participation in the workplace, is at the heart of clinical education.^{19,20} While workplace learning has been recognized as the crux of GME, we would argue it is also essential for UME. Certainly it has a clear role in clerkship learning so the use of EPAs there seems evident. One could argue that preclerkship learning is knowledge-focused classroom-based learning in which workplace learning and therefore EPAs (which are workplace activities) do not have a role. However, educators have called for, and medical schools have increasingly incorporated, early/preclerkship workplace-based clinical education to help students in their professional identity formation, provide exposure to aspects of patient and community health, and develop student-patient communication skills.²¹ Vertically integrated clinical curricula with early clinical experiences and increasing clinical responsibilities over time have been shown to improve clinical capabilities in graduates and their preparation for transition to residency.²² In addition, students in even the first year of medical school have demonstrated the ability to participate in and contribute to the clinical workplace when given the opportunity, clear roles, and adequate support.²³

In the clinical workplace, trust is a key element of the supervision of learners. Here, clinical supervisors make decisions to invite learner participation or provide learner responsibilities for patient care based on their trust of the individual learner. This trust is a judgment grounded in multiple factors related to the supervisor, learner, supervisor-learner relationship, situational and workplace context, and activity to be performed.²⁴ The factors that have been described, including learner factors such as competence/experience, attitudes, and insight into limitations, are generalizable to learners at all levels and applicable to different workplace environments.^{24,25} Similar to the entrustment decisions clinicians make about residents, clinical supervisors also make daily decisions about whether to trust individual students with specific activities.

Recognition and Quality Assurance of Student Work

Attention to student abilities framed around clinical workplace activities has several advantages. As noted above, EPAs can help clarify the nature of students' early clinical engagement and increasing responsibilities over time. They also allow articulation of how students can contribute to the care of patients from the very beginning of medical school, and make visible these student contributions and the value they add to patient care. This definition and recognition of student work can help educators align student output with student learning goals and motivation, institutional expectations, and societal needs. Explicit recognition of levels of student participation and clarity around activities that can be entrusted promote quality and safety in the clinical workplace. It can increase transparency for the public about how we are addressing our obligation to provide safe care and may even be helpful for teaching hospitals to meet regulatory needs.

The Joint Commission International, which accredits hospitals, places attention squarely on student privileges—not just their achievement of competency expectations but whether they can be trusted to safely perform specific patient care activities. Examples of student privileges or activities recently introduced at the University Medical Center Utrecht include “providing non-therapeutic medical information to patients,” “requesting routine laboratory investigations,” and “placing urine catheters,” among many others.²⁶ These smaller activities may serve to cluster into EPAs. It has been suggested that digital badges encoded with just such this type of information about the individual student can be accessed by others in the workplace (faculty, supervising residents, allied health professionals, etc.) to determine delegation of or student participation in patient care responsibilities.²⁷ These EPAs also may well serve as reminders and assurances to the students, workplace community, medical centers, and the public that students can and do provide safe and value-added patient care. In addition, when stakeholders are able to ensure that the contributions made by students are safe and value-added, students may be allowed to assume greater responsibility and participate even more actively in the provision of patient care.

Considerations

We acknowledge that a significant amount of UME learning is focused on knowledge and foundational skill-building and limited to the classroom, where EPAs do not have a direct role. However, the final expected outcomes of UME training can be captured by EPAs that require the achievement and contextual application of these basic knowledge and skills. Also, as early clinical experiences are increasingly introduced and vertically integrated into the later clinical curriculum, it becomes important to apply workplace-based assessments across all years of UME training. Just as the integration of a set of GME EPAs may reflect the professional activities of a subspecialty, so too can an integrated set of thoughtfully constructed UME EPAs reflect the professional activities of a medical school graduate. Care would need to be taken to make sure the EPAs relate to the overarching goals of the medical school and have defined milestones to allow for assessment of the classroom-based learning that will support these workplace activities. We believe that EPAs may be an excellent key to

the legitimate peripheral participation recommended by Lave and Wenger for early learners in a professional community of practice.²⁸

WHAT WOULD UME EPAS LOOK LIKE?

Because medical training is a continuum, logically, UME-level EPAs should align with GME-level EPAs. One approach would be to use the same or similar EPAs in UME as in GME. For instance, one could use the same EPA title but explicitly limit the scope of the EPA in its description for UME learners (e.g., limit activity to cooperative or medically stable patients). However, even with limitations in scope, the EPAs developed for GME are large units of combined complex activities requiring complex high-order skills¹¹ (e.g., care of complicated pregnancies [obstetrics/gynecology],⁵ care for a well newborn [pediatrics],²⁹ manage care of patients with chronic diseases [medicine],³⁰ care for patient with delirium [psychiatry]¹⁵). With approximately 20 EPAs encompassing the competency expectations for a specialty,^{5,11,29,30} these EPAs are likely at too high a level and too broad to be practically useful for assessment in UME.

We recognize a hierarchy in the organization of learning, such that more complex, higher-order skills or activities are built from simpler, subordinate skills or activities.³¹ Therefore, another approach would be to develop UME-specific EPAs that represent subsets of activities that will eventually integrate together and nest within broader EPAs to provide the foundation for GME-level activities. These would be more practical for implementation by targeting assessment at the expected UME-level of development. Such EPAs could be defined based on the list of graduation competency expectations or objectives most medical schools have. Alternatively, all beginning GME learners are entrusted with certain activities on day one of their training, such as gathering a history and performing a physical examination appropriate to the clinical situation. These can serve as a starting point for defining core EPAs for UME. This is the approach taken by the AAMC. Stakeholders recently convened a national committee to define EPAs for UME and have published a set of thirteen draft core EPAs for entering residency (CEPAER).¹ Together these core EPAs represent the baseline activities required to support GME EPAs across all specialties. The AAMC notes that these are the very basic core EPAs. They do not address different expectations across individual institutions nor are they meant to encompass specialty-specific graduation competency expectations of individual specialties.

In addition to general skills such as the thirteen defined by the AAMC, slightly different competency expectations of medical school graduates will be held by different fields. For instance, the expectations for a beginning surgical resident are generally different than those for a beginning psychiatry resident. Discussion about whether medical school should prepare graduates in a generic or in a more specialized approach is ongoing.^{2,17} At the moment, medical students graduate with core skills as well as early specialty-specific skills, mostly gained through electives in their final year of medical school.³² Even careful consideration of the traditional clerkship rotations may reveal overlap of core and specialty-specific

knowledge and skill expectations. Thus, we should also define specialty-specific EPAs for UME that can serve as selective achievements for students preparing to enter specific GME programs of their choosing. These specialty-specific EPAs would link more directly to GME-level EPAs and the level of entrustment that should be achieved would differ by student based on career path. These specialty-specific EPAs could guide student selection of senior year electives as well as help program directors ensure a baseline competency level of their entering residents. If operationalized properly, these specialty-specific EPAs could ease advising during the fourth year, ensure more adequately prepared entering residents, and obviate the need for extracurricular “boot camps”^{33–35} before or during residency. Lastly, in addition to the basic core EPAs mandatory for all students and specialty-specific EPAs mandatory for students preparing for specific GME programs, we could define optional EPAs individual students could achieve based on their capacities and interest. For instance, schools offering required or elective scholarly concentration programs could have EPAs related to each area of scholarly concentration^{36,37} (see Table 1).

Table 1: Proposed Types of Entrustable Professional Activities for Undergraduate Medical Education

Type	Requirement	Examples
Core basic EPAs	Mandatory: Achieved by all medical students at graduation	<ul style="list-style-type: none"> Association of American Medical Colleges core EPAs for entering residency (CEPAER)¹
Core specialty-specific EPAs	Mandatory: Achieved only by medical students entering a specific residency training program	<ul style="list-style-type: none"> Surgery-specific UME-level EPAs Pediatric-specific UME-level EPAs Other residency-specific UME-level EPAs
Individual elective EPAs	Optional: Achieved by students who have additional capacity and/or interests	<ul style="list-style-type: none"> Specialty-specific UME-level EPAs in area outside planned residency training GME-level EPAs in area of planned residency training Scholarly concentration-related EPAs (global health, health policy, medical education, etc.)

Abbreviations: UME indicates undergraduate medical education; EPA, entrustable professional activity; GME, graduate medical education.

ENTRUSTMENT IN UME

EPAs set forth definitions of clear workplace tasks for students that can allow students to assume greater responsibility and participate more actively in patient care, which can in turn increase their motivation to learn.²⁰ Some students could potentially demonstrate readiness for practice of certain core or specialty-specific EPAs earlier than typically expected in the training continuum. To support safe escalation of student responsibilities, we need to very

clearly and thoughtfully define the degrees of supervision for students. One consideration is whether the entrustment and supervision scale currently in use in GME can be applied to UME.

The GME entrustment and supervision scale uses five different levels of supervision to define the levels of entrustment, providing few levels of gradation for the beginning learner¹⁹ (see Table 2). As noted previously, medical students may never practice without supervision. Under the GME entrustment and supervision scale, students would only progress from level 1 (not allowed to practice EPA) to levels 2 (practice EPA under proactive/full supervision) and 3 (practice EPA under reactive/on-demand supervision) for most activities. Therefore, it may be helpful and more practical for UME to include additional levels resulting in more granular progression in the decrease in supervision. These additional levels would be particularly helpful if EPAs are to be operationalized for assessments along the entire trajectory of UME training. One possible consideration could be to develop a different entrustment and supervision scale for UME. However, if one advantage of using EPAs as a UME competency framework is the potential for continuity of UME and GME training, one would ideally prefer to use a single entrustment and supervision scale throughout the course of medical training.

We therefore recommend using the current entrustment and supervision scale but expanding the lower levels of the scale to include more gradations of supervision, allowing additional layers of progressive learner autonomy. For instance, full or active supervision can be subdivided into two levels. To start, the learner practices the activity in collaboration with the supervisor as a *co-activity*. Then as the learner advances, he performs the activity on his own with the supervisor in the room and ready to assist when needed. This distinction between the types of full supervision may be particularly useful for procedural skills. Similarly, practice under reactive or on-demand supervision could be further broken down into levels with the supervisor outside the room but physically nearby and immediately available or, for a more advanced learner, with the supervisor at a distance and readily available by phone. The AAMC in its description of expected level of achievement for its core EPAs for entering residency proposed a similar expansion of the definition of reactive/on-demand or indirect supervision.¹ We also recommend adding into these levels for reactive supervision gradations in the amount of verification the supervisor performs on the learner's work. For instance, to support graduated autonomy, the supervisor can initially check all completed work, then check just a sample of the completed work, and finally only reviews the learner's report of the completed work² (see Table 2). Naturally, full entrustment for unsupervised activities may never happen within UME for most tasks. However, the progression from supervisor presence in the room to trusting the student to ask for help only when needed is a significant milestone towards autonomy.

To conclude, EPAs can bring added value to UME. In contrast to GME, there has not been similar implementation of a standard competency framework in the United States for medical student performance expectations. UME EPAs, such as those proposed by the AAMC, may

Table 2: Current Graduate Medical Education and Proposed Undergraduate Medical Education Entrustment and Supervision Scale

GME entrustment and supervision scale ¹⁵ (5 levels)	Proposed UME entrustment and supervision scale (expanded to 9 levels)	Example: CEPAER - perform general procedures of physician ¹ (e.g., intravenous line insertion)
1. Not allowed to practice EPA	1. Not allowed to practice EPA <ol style="list-style-type: none"> Inadequate knowledge/skill (e.g. does not know how to preserve sterile field); not allowed to observe Adequate knowledge, some skill; allowed to observe 	1a. Student needs training in patient confidentiality and universal precautions 1b. Student observes supervisor insert IV line
2. Allowed to practice EPA only under proactive, full supervision	2. Allowed to practice EPA only under proactive, full supervision <ol style="list-style-type: none"> As co-activity with supervisor With supervisor in room ready to step in as needed 	2a. Student and supervisor work together to insert IV; student applies tourniquet and inserts IV with active verbal guidance from supervisor who points out target vein, hands over equipment and secures IV with tape 2b. Student inserts and secures IV alone with supervisor observing closely and ready to step in and assist if necessary; supervisor provides feedback afterwards
3. Allowed to practice EPA only under reactive/on-demand supervision	3. Allowed to practice EPA only under reactive/on-demand supervision <ol style="list-style-type: none"> With supervisor immediately available, all findings double checked With supervisor immediately available, key findings double checked With supervisor distantly available (e.g. by phone), findings reviewed 	3a. Student inserts and secures IV with supervisor outside room; supervisor closely double checks IV site for position, function, security and any complications before IV is used 3b. Student inserts and secures IV with supervisor outside room; supervisor takes quick look at IV before or as IV is used 3c. Student inserts and secures IV with supervisor not on ward and reports completion of task to supervisor; supervisor only checks IV before IV is used if difficulty or problem is reported
4. Allowed to practice EPA unsupervised	4. Allowed to practice EPA unsupervised	4. Student independently inserts, secures, and begins use of IV without contact with supervisor (may not be achievable or allowed at some institutions)
5. Allowed to supervise others in practice of EPA	5. Allowed to supervise others in practice of EPA	5. Student supervises junior students in basic steps of IV insertion (may not be achievable or allowed at some institutions)

Abbreviations: GME indicates graduate medical education; UME, undergraduate medical education; EPA, entrustable professional activity; CEPAER, core EPAs for entering residency; IV, intravenous.

help to focus UME assessment more directly on workplace activities as well as provide tangible ways to address other challenges in medical education. Adoption of the EPA framework in UME would allow alignment with the EPAs being developed in GME and provide a true continuum in medical training. EPAs can increase transparency in the workplace regarding student abilities and activities from the very beginning of medical training. We believe EPAs can be operationalized for UME if we develop UME-specific EPAs, as suggested by the AAMC. However, we should expand beyond the AAMC recommendations to include EPAs that represent specialty-specific and elective professional activities and further refine and expand the entrustment scale to include additional gradations of supervision. If operationalized appropriately, EPAs may prove to be a powerful way to assess students in the workplace and allow students to truly contribute to patient care while ensuring patient safety.

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Chapter 3

Legitimate Workplace Roles and Activities for Early Learners

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ABSTRACT

Objectives

Given the calls for earlier student engagement in clinical experiences, educators are challenged to define roles for pre-clerkship students that enable legitimate participation in clinical practice. This study aimed to determine the student roles and activities, as well as the clinic characteristics, that allow early student engagement within a specific clinical experience.

Methods

The authors conducted semi-structured interviews in December 2011 and January 2012 with a purposive sample of medical student and faculty volunteers at student-run clinics (SRCs). They were asked to discuss and compare student roles in SRCs with those in the core curriculum. An inductive approach and iterative process were used to analyse the interview transcripts. Themes identified from initial open coding were organised using the sensitising concepts of workplace learning and communities of practice and subsequently applied to code all transcripts.

Results

A total of 22 medical students and four faculty advisors were interviewed. Thematic analysis revealed pre-clerkship student roles in direct patient care (patient triage, history and physical examinations, patient education, laboratory and immunisation procedures), and in clinic management (patient follow-up, staff management, quality improvement). Students took ownership of patients and occupied central roles in the function of the clinic, with faculty staff serving as peripheral resources. Clinic-related features supporting this degree of legitimate participation included defined scopes of practice, limited presenting illnesses, focused student training, and clear protocols and operations manuals.

Conclusions

Pre-clerkship students are capable of legitimately participating in patient care experiences to an extent not usually available to them. The SRC represents one example of how early clinical experiences in the core curriculum might be transformed through the provision of patient care activities of narrow scope.

INTRODUCTION

Current challenges in medical education include training that is often not learner-centered and lacks integration between acquisition of formal knowledge and experiential learning.^{1,2} Early engagement in patient care roles can help students acquire knowledge, provide relevance for their learning, and support their socialisation into the profession.²⁻⁴ Regulatory and professional bodies have advocated for early and continuing clinical workplace experiences.^{5,6} Increasingly, medical schools offer early clinical experiences with real patients.⁶

The clinical environment can be a site for both learning and the application of knowledge and skills. However, the richness of that workplace learning depends on the interactions and activities in which students participate, and on the degree of their engagement.⁷ The clinical workplace can be seen as a community of practice, which Lave and Wenger⁸ described as a group of people with common interests who engage and interact in shared activities during which learning occurs socially through the act of participation. As newcomers to this community of practice, students start at the periphery and embark on an inbound trajectory over the course of their training during which they occupy increasingly central roles leading to full participation in the profession.⁸ The more meaningful and valued the students' contributions to the community of practice, the greater their engagement and learning.^{8,9} Lave and Wenger⁸ recommend that students participate 'legitimately' in the activities of the workplace, even if they do so at the periphery (legitimate peripheral participation). Students achieve *legitimacy* when they feel they are actual members of the workplace and participate in activities that contribute to the work of the workplace.⁸

Billett⁷ describes a second important factor in workplace learning, that of workplace *affordances*. These are the activities, interpersonal dynamics, and rules and norms of practice in the workplace that provide opportunities for and invite or allow learner engagement.^{7,10} Workplaces differ in their affordances. The clinical workplace, in particular, rarely invites early student participation. Despite the movement towards integration of early clinical experiences, patient contact in the pre-clerkship (initial) years of the core medical school curriculum largely remains one of observation and exposure rather than one of legitimate peripheral participation.¹¹⁻¹⁷

Advocating for legitimate peripheral participation in early clinical experiences requires exploration of the types of roles and activities and workplace affordances that allow for participation in patient care. In the USA, the student-run clinic (SRC) is a common clinical entity¹⁸ that routinely relies on pre-clerkship medical students to provide direct patient care services under the supervision of licensed volunteer physicians.^{19,20} Such SRCs provide free or low-cost care for underserved populations who may be uninsured, underinsured, or unable or unwilling to interact with the health care system. Guided by the frameworks of workplace learning and communities of practice, and within the context of SRCs, we explored the following questions: (i) What roles do pre-clerkship students assume and in what patient care activities do students legitimately participate? (ii) What is the level of student engagement in

these practices? (iii) What affordances of the clinical sites of practice (SRCs) allow this degree of participation?

METHODS

Design

This was a single-institution, multi-site qualitative study of early clinical experiences in the selected context of SRCs. We analysed student and faculty interview data collected as part of a larger study. The previous study had focused on learning opportunities in SRCs in the competency domain of systems-based practice.²¹ The present study concentrated on the clinical experiences of pre-clerkship students in the SRC environment. It used data not previously analysed or published.

Context

We conducted this study at the University of California San Francisco (UCSF) School of Medicine, with approval from the UCSF Institutional Review Board. All four SRCs at UCSF provide care only for underserved populations. These underserved populations include people who have poor access to care or face other barriers that can be economic (uninsured, underinsured and low-income status), cultural or linguistic, demographic (immigrant, low literacy, homeless status), or geographic (lack of transportation). Clinica Martin-Baró emphasises the provision of culturally sensitive primary care for Latino day labourers, is open one weekend morning per week, and has approximately 45 medical student volunteers per year. Homeless Clinic provides general and specialty (women's health, dermatology, smoking cessation) acute care to the homeless population at a San Francisco homeless shelter on two weekday evenings per week and has about 60 medical student volunteers per year. The San Francisco Hepatitis B Collaborative primarily serves the Asian community, providing hepatitis B screening, vaccination and education on two mornings per month and hosting approximately 25 medical student volunteers per year. Mabuhay Health Center provides primary care and health education to uninsured Filipino patients on one weekend morning per month and has about 25 medical student volunteers per year. A previous article describes these clinics further.²¹

Medical student volunteers almost exclusively include students in Years 1 and 2. Approximately 70% of medical students in Years 1 and 2 elect to participate at least once in an SRC each year, and about 20% of Year 2 medical students assume leadership roles as clinic coordinators with responsibility for the organising and running of the clinics. Each SRC also engages other student volunteers, including undergraduate, nursing, pharmacy, and dental students. Volunteer preceptors who are licensed rotating practitioners provide on-site supervision of care. In addition, two-three doctor faculty advisors provide longitudinal oversight at each clinic.

The UCSF core curriculum consists of 1.75 years of pre-clerkship classroom-based learning followed by 2.25 years of clinical rotations. In a longitudinal clinical skills course throughout the pre-clerkship curriculum, students practise interviewing and physical examination skills with peers and real and standardised patients, and participate in preceptorship experiences in adult and paediatric clinical settings primarily in the community.

Participants

We invited current Year 2 medical student SRC volunteers and coordinators, final-year medical students who had previously been volunteers or coordinators, and faculty advisors for each of the four SRCs to participate in individual interviews. In qualitative research, participants are recruited for their expert knowledge of the phenomenon under inquiry and typically not on a representative basis.²² We therefore used purposive criterion sampling (purposeful recruitment of participants representing specific categories and meeting a criterion [SRC experience])²³ to ensure a distribution across the four SRCs, the representation of both volunteers and coordinators, and the inclusion of current and former volunteers and coordinators. We interviewed more coordinators than volunteers because all coordinators had also served as volunteers and could provide both perspectives. We did not include Year 1 medical students because at the time of the study, they had been in school for < 3 months and had had limited opportunity to participate in SRCs or core curricular preceptorship experiences.

Instrument

In developing a guide for our semi-structured interviews, we consulted with faculty staff and students who were knowledgeable about the SRCs, the core pre-clerkship clinical skills curriculum, and educational research. We generated five broad questions about roles and activities. Questions included: (i) What do medical student volunteers do at the clinic? (ii) What do the coordinators do as leaders of the clinic? (iii) What is the role of the clinic's faculty advisors? (iv) What different roles, activities, or learning do students experience in the clinic compared with in the core curriculum? (v) Why did you decide to participate in the clinic and what do you feel was most valuable about your participation? We piloted the interview guide with four previous clinic coordinators and made minor refinements to the questions for clarity.

Procedure

One author (LS) identified four former coordinators for the pilot interviews. She recruited additional coordinators and faculty advisors using contact information available on the SRC websites. The coordinators provided names of volunteers for recruitment. We interviewed the first respondents for each SRC. One person (LS) conducted semi-structured interviews with all study participants, either in person or by telephone, between December 2011 and January 2012. Each interview took approximately 30-60 minutes. On average, coordinators and faculty members gave longer interviews than volunteers. All interviews were audio-recorded, and the audio files were transcribed and de-identified.

Data Analysis

We incorporated all interviews, including the pilots, in our data analysis because we made only minor refinements to the interview guide after the pilot interviews. Three authors (HCC, LS, and AT) carried out inductive thematic analysis of the interview transcripts using an iterative process (multiple rounds of analysis). In inductive thematic analysis, themes are not imposed, but emerge naturally from the data.^{23,24} After familiarising ourselves with the transcripts, we first conducted open coding of the same five randomly selected transcripts. We compared our coding lists, reconciled differences, and identified major themes. Second, we organised the themes using the sensitising concepts of workplace learning and communities of practice. Sensitising concepts are concepts brought to data analysis to allow for a frame of reference in organising and reporting the emergent themes.^{23,25} The inductive application of sensitising concepts to data analysis also allows examination of how the concepts (workplace learning and communities of practice) manifest in a particular setting (the SRCs).²³ We were able to map all codes and themes to the sensitising concepts.

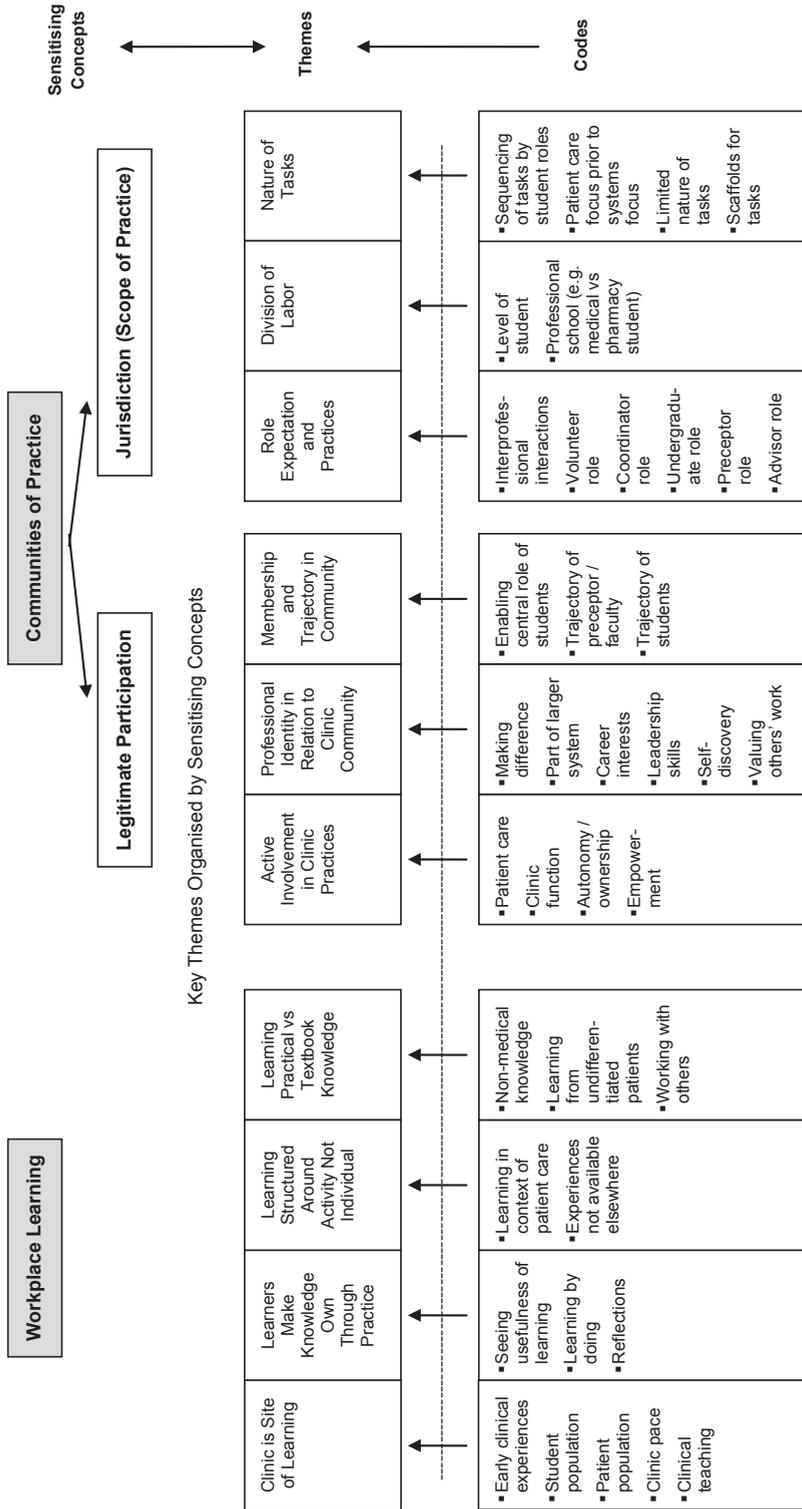
Figure 1 shows the relationships of the codes (shown below the dotted line) and identified themes (just above the dotted line) to the sensitising concepts of clinical workplace learning and communities of clinical practice.^{7,9,10,26} To aid the reader in understanding the figure and the indicated relationship between the identified themes and sensitising concepts, we briefly explain the latter. In workplace learning, the clinical setting is the site of learning. There, learning occurs through practice, is structured around activities of the workplace, and is focused on practical knowledge.¹⁰ Egan and Jaye²⁶ apply research on workplace learning and communities of practice to the clinical workplace. They describe the legitimate participation of students as members of a clinical community of practice. They also discuss the concept of jurisdiction (or scope of practice) of the community of practice with defined roles, tasks, and divisions of labour among its members.²⁶

From this organising framework of workplace learning and communities of practice, we developed a codebook for thematic analysis of the transcripts. Thematic analysis involves analysis across a dataset for repeated patterns of meaning.²⁴ Two authors (HCC and AT), using the codebook, independently coded transcripts of all student and faculty advisor interviews. The authors met to discuss and reconcile any discrepancies. No new codes were added beyond those initially defined from the first five transcripts. NVivo Version 9 (QSR International Pty Ltd, Doncaster, Vic, Australia) was used for data organisation.

RESULTS

We interviewed 22 medical students, including eight volunteers (one current and one former from each SRC) and 14 coordinators (two current and one or two former from each SRC), and four faculty advisors (one from each SRC). We identified key themes related to learning in the workplace, legitimate participation and scope of practice (Fig. 1). We used this organisation of the themes to focus on students' workplace roles and activities, the legitimacy

Figure 1: Interview Themes Mapped to Sensitising Concepts of Workplace Learning and Communities of Practice



Interview Codes Clustered by Key Themes

of student participation and depth of engagement, and the impact of practice scope on student roles, activities, and depth of engagement.

What roles do students assume in the SRC workplace and in what patient care activities do they legitimately participate?

Student volunteers primarily used their knowledge and skills to provide direct patient care in the context of patient need. They engaged in patient care activities such as triage; the obtaining of histories and conducting of physical examinations; the provision of patient education; the performance of procedures such as pap smears, phlebotomy, and vaccinations; the documentation of encounters; and in some cases the completion of billing forms. In some clinics, the volunteers also ran community circles with waiting patients to discuss patient concerns and provide patient education, and helped patients access primary care providers and enrol in the city's health services programme.

Although student coordinators participated in similar patient care activities, especially in more complicated patient cases, their primary role was to organise and run the clinic. During clinic, they managed patient flow, tracked patients who were waiting to be seen, supervised laboratory and immunisation procedures, provided on-the-spot trouble-shooting, handled referrals, and ensured patient follow-up. They were responsible for patient recruitment, community outreach, clinic set-up and equipment checks, clinic supplies, budgeting and procurement of funding (fundraisers, grants), communications with internal and external stakeholders, the solicitation of patient and participant feedback, outcomes assessments, and quality improvement activities.

These student roles and activities differed from those offered in the core curriculum. Students felt interviewing standardised patients or patients on the ward and in their preceptor's offices were learning exercises in which patients were doing the students a favour. In the SRCs, the students felt they contributed to the provision of care needed by the patients rather than being a burden in the workplace:

So [in the core curriculum] we see standardised patients, we do get a lot of practice on how to talk to patients and we also go to our preceptorship to get patient exposure, see what it's like to work in a hospital. But what we don't have is that, knowing what you do really makes a difference or really matters... we actually are seeing these patients as if it's our own and that we do the blood draw, interpreting results have real effects on the patient and that's something that we really value. (Student interview)

Faculty concurred with this perspective on the students' role.

So we have real people who come in and need something where we are helping them... and that is a very important, the most important feature. [In] so much of medical school, even during clerkship, [the] student's role is peripheral and non-accountable... And that's not what medicine is. Medicine is not peripheral and it's

highly accountable... Accountability is a big part of [the SRC experience]. (Faculty member interview)

What is the level of student engagement in these activities?

Students were empowered to take ownership of their patients and the clinic. As one faculty advisor explained, ‘...students are able to run the clinic more or less themselves.’ Coordinators developed and ran the student training programmes, and consequently, ‘brought up the next generation [of volunteers and coordinators] themselves’. They set up the clinic and trained volunteers before preceptors arrived, and oriented the preceptors. After the preceptors left, the volunteers and coordinators debriefed on the day among themselves and generated ideas for clinic improvement. Coordinators subsequently developed patient handouts, updated clinic protocols and policies, developed and implemented new programmes, performed community outreach, and changed clinic set-up and flow:

That was something we thought we could improve, so we came up with a strategy on how to improve, implement it, and try to measure what the difference was before and after. (Student interview)

This is a completely student-run clinic so we’re very autonomous in deciding how we want clinics to run, we’re very hands-on on that. And so the medical students have much more input in how the clinic gets run and what our vision is of the clinic, and the care that we want to provide. (Student interview)

The preceptors and advisors helped facilitate students’ work by serving as resources. Preceptors ensured quality of care by providing on-site support of volunteers in their patient care roles. They made sure patients were triaged safely, verified findings, supervised clinical decision-making, and finalised all management plans. Faculty advisors provided mainly off-site advice and hands-off support to coordinators in their roles in clinic function. For instance, although advisors provided guidance about the provision of clinical services and facilitated relationships with outside agencies, they were not necessarily well aware of the financial aspects of the running of the clinic. They reviewed and supported student ideas for clinic improvements, but students worked independently to conduct small studies (e.g. needs assessments, satisfaction surveys, quality improvement projects):

The faculty’s role is just to keep things on track and then to be teachers and supporters at the actual clinic sessions. (Faculty member interview)

Both preceptors and advisors often deferred to the student coordinators, who had more knowledge about the patients and clinic process:

[The students] are far more, especially the ones that work a lot, they are much more knowledgeable about the patient and the process than any of the preceptors so it does kind of shift the bound of power a bit. (Faculty member interview)

Faculty advisors also observed that their empowerment of the students impacted the students' relationships with patients. As one faculty member commented, in the typical clinic setting of the core curriculum:

...the primary relationship [of patients] is with the preceptor and faculty that run the clinic, whereas in the [SRC], the primary relationship really is with the students.
(Faculty member interview)

What affordances of the SRCs allow this degree of participation?

As a result, in part, of its focused mission and sometimes its limited resources, each clinic had a narrow and defined scope of practice, which in turn focused student work. For instance, the Hepatitis B Collaborative provided screening and education for one disease entity. The clinics that provided more general care functioned either as a bridge between primary care provider appointments or as an entry point into the health care system. The clinics addressed non-urgent acute problems or provided a checkpoint for more chronic issues, offering, for instance, blood pressure checks for patients with hypertension. They provided or prescribed a limited number of medications. Procedures were restricted to pap smears, phlebotomy, PPD [purified protein derivative] placement, and vaccinations. Students were trained to refer patients to urgent care clinics and emergency rooms for more urgent or serious problems or for additional diagnostic studies, and to the county hospital or back to the patient's primary care provider for longitudinal care. As a result, the range of presenting problems was small (e.g. upper respiratory illness, musculoskeletal complaints, athlete's foot, cellulitis, constipation, asthma, hypertension, diabetes, hyperlipidaemia).

Another affordance of the SRCs concerned the focused training the clinics provided to students to allow them to engage in the clinic to the extent described herein. Training for students occurred in two ways: formally, and in-the-moment. Students enrolled in SRC-required associated courses that educated them in health issues relating to the population served by the respective SRC, including common presenting health concerns and community resources, in basic clinical skills such as documentation, and in procedural skills essential to the SRC such as phlebotomy. One clinic required volunteers to take formal health coach training through the Department of Public Health. Another provided training in the use of interpreters. In addition, all clinics included just-in-time review and training sessions prior to each clinic session and ended sessions with group reflections and feedback.

Much of the training occurred in the moment using 'information that was passed on from each generation of volunteers'. Student volunteers were trained by student coordinators who were experienced as volunteers or by more senior medical student volunteers. New volunteers were paired with more experienced volunteers. Volunteers aspiring to be future coordinators shadowed current coordinators and received specific coordinator training. Volunteer clinician preceptors provided additional in-the-moment training in basic clinical skills (questions to ask in history-taking, physical examination techniques) and clinical reasoning (by coaching through the differential diagnosis and initial plan), and offered

performance feedback intended to help students improve skills (on oral presentations and note writing).

The clinics used additional tools to structure student activities and afford added support. Students had clear roles, and activities were sequenced based on student experience. Handbooks provided to all volunteers included disease-specific information sheets and protocols for dealing with common presenting problems. One clinic employed a history questionnaire that could be filled out by waiting patients to help guide student history-taking and ensure the capture of key information. Coordinators used written operations manuals to answer challenging clinical or operations questions that might come up and to determine outside referrals and access to community resources. Coordinators discussed new challenges that arose with the clinic faculty advisors, and solutions and protocols were then developed and added to the manual.

DISCUSSION

The SRCs demonstrate that early medical students are capable of participating in patient care experiences that are typically reserved for more advanced learners and can engage to an extent not available to them in the core curriculum. When given the opportunity, pre-clerkship students assume roles and perform activities in both patient care and clinic functioning which contribute to the work of a clinical practice. The challenge, as Yardley *et al.*²⁷ describe, lies in balancing patient safety with meaningful patient care activities for students. They note that clinical workplaces generally address risk by denying students opportunities to participate rather than by developing graded student responsibilities with appropriate supports.²⁷ We found that the SRCs invited student participation and addressed risk by providing narrowly focused responsibilities within a highly structured environment. The limited scopes of practice and access to focused training and support served to grade student responsibilities, thereby affording pre-clerkship students opportunities to engage at the depth required for legitimate participation. Although our findings are based in the specific setting of SRCs, which are relatively unique to the USA, we believe these results can help identify ways to improve early clinical experiences for learners in all types of clinical setting within the core curriculum.

Student engagement in the SRCs was characterized by students' membership within the SRC community of practice that was more central than that of their supervising preceptors. In the core curriculum, preceptor-student-patient interactions typically focus on the preceptor-patient relationship and keep the student at the periphery, or sometimes consist of a triangular preceptor-student-patient relationship.^{28,29} In the SRCs, clinical interactions focused on the primary relationship between the student and patient, and the preceptor functioned as a resource at the periphery. Furthermore, whereas students in the core curriculum traditionally rotate as brief visitors through a variety of clinical services, which places them on a relatively peripheral trajectory, in the SRCs the preceptors rotated and the students exhibited an inbound trajectory.²⁶ As students moved from the role of volunteer to that of coordinator,

they also took on central roles in clinic function. Student coordinators occupied pivotal positions usually held by faculty staff in the traditional clinical workplace to organise clinic operations and manage quality improvement.

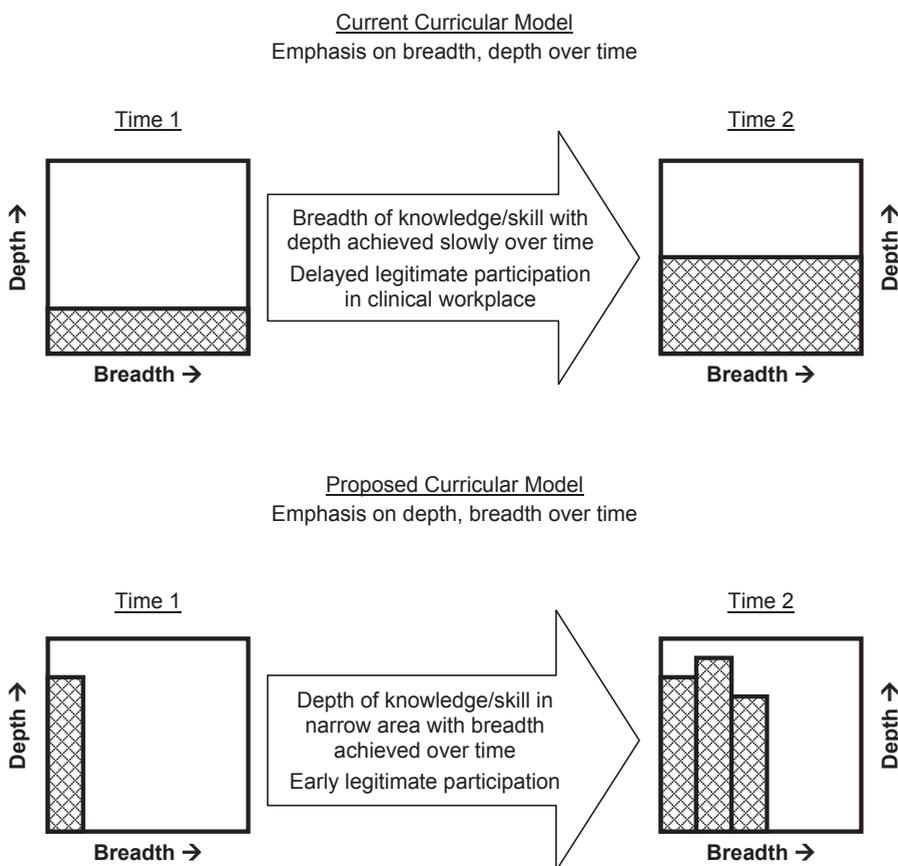
The success of SRCs in enabling greater legitimate participation by pre-clerkship students relates to their distinct affordances of limited scope and concentrated student support. Rather than taking a comprehensive approach to student education on topics such as infectious diseases, immunisations, the various types of injections (intramuscular, subcutaneous, etc), or national systems for vaccine delivery, the SRCs provided students with only what they needed to know to function in that particular clinic. Students worked with patients who came in with a limited range of diagnoses, which had been anticipated and for which scripts, guidelines and protocols from which to work were available. Similarly, students worked on solving only focused clinic operations or quality improvement issues within a specific SRC, which represented a small-scale clinical unit within which they worked and with which they were familiar. These affordances allowed inexperienced students to legitimately participate in the provision of patient care and the function of the clinic to a degree that even more experienced students might find difficult in the core curriculum.

The current approach to medical education focuses on the provision of breadth, with a gradual layering-on of depth, particularly in the preparation of learners for hands-on clinical experiences (Fig, 2). Faculty staff preferentially place students in generalist settings with wide scopes of practice. As students are not allowed to assume certain roles and responsibilities until they have reached a specific depth of knowledge and level of skill, the time required to prepare them to legitimately participate in these workplaces is lengthy. To limit the impact of potential student errors, we therefore relegate pre-clerkship students to the periphery of the workplace, where they have little patient contact and systems involvement.

An alternate strategy might be to have students achieve depth in a narrow clinical area and then to build breadth over time. Rather than using the generalist setting to train early learners, we might consider small clinics with limited scope, analogous to that of the SRC. Students might preferentially be placed in subspecialty or focused or single-condition clinics such as allergy, diabetes, tuberculosis or surgical subspecialty clinics. In general clinics such as that in paediatric acute care, we could identify the most common presenting chief complaints or diagnoses, provide focused knowledge and skills training, and limit the encounters of early students to patients with those chief complaints or diagnoses. Two medical schools have followed this strategy of training students deeply in limited areas and have found that pre-clerkship students are able to successfully coach patients with diabetes and serve as emergency medical technicians in a health care system.^{30,31}

Incorporating robust and meaningful early clinical experiences into the core medical student curriculum is subject to numerous challenges. One such challenge refers to the fact that, as currently used, early students do not contribute to the work of a clinical practice, and economic and productivity pressures have limited the capacity of clinical settings and the willingness of faculty staff to invite students into the workplace.^{32,33} The present study

Figure 2: Emphases on the Acquiring of Breadth and Depth in, Respectively, the Current and Proposed Curricular Models



reveals that pre-clerkship students can legitimately contribute to the clinical workplace. Another challenge concerns the suitability of patients for medical students. Changes in health care have influenced the types of patients seen, lengths of stay and care delivery models in academic medical centres; the result is an increase in prevalence of more complicated, sicker patients with subspecialty problems, who are generally felt to be better suited for consultation with senior learners.³⁴ These challenges, along with an increasing emphasis on quality, have decreased the patient care roles available to all early learners, including junior residents and senior medical students.¹ The SRC example suggests that patients in subspecialty clinics may be appropriate or even preferable for junior learners and that concerns about risk and quality might be managed by providing students with targeted supports with which they can accomplish focused responsibilities.

There are limitations to this study. All participants in the SRCs were volunteers and, although they represent 70% of our students, the affordances which allow engagement of these students may not be similarly effective for non-volunteers, who may have differing

interests or capacities for deep clinical engagement. Student-run clinics are safety-net clinics that provide care to underserved patients and may not be subject to the same productivity or quality metrics as other clinical settings. The successful replication of the SRC model of early learner engagement may require adjustments to current service delivery and economic models of clinical care. Although productivity pressures and economic models may differ, studies on the quality of care delivered in SRCs have shown the standard of care delivered to be consistent with that required by national guidelines and demonstrated quality-of-care indicators comparable with or exceeding those in uninsured populations and comparable with those in insured populations.³⁵⁻³⁸

The SRCs provide an example of how we might transform early clinical experiences in the core curriculum from one primarily of observation to one that is learner-centered and enables meaningful engagement and learning. We should consider changing the paradigm of medical education so that we educate with a focus on preparing students for rapid early and legitimate engagement in the workplace by emphasizing achievement of depth in limited areas before we concentrate on building breadth over time.

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Chapter 4

Developing Entrustable Professional Activities for Entry into Clerkships

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ABSTRACT

Purpose

Despite growing emphasis on early clinical experiences, preceptors continue to face challenges integrating and assessing pre-clerkship medical students in their practices. Entrustable professional activities (EPAs), which frame competencies within the context of clinical workplace activities, may provide explicit guidance for students' clinical roles and activities. This study describes the development and appraisal of content validity evidence for pre-clerkship EPAs.

Methods

The authors employed a multi-step process from November 2012 to June 2014. They first identified EPA content domains using study data, student focus groups, and preceptor interviews. They mapped each domain to pre-clerkship course objectives, graduation competencies, and resident-level EPAs to ensure content relevancy and adequacy. They then developed, with expert consultation, full EPA descriptions for each domain with activity specifications; expected knowledge, skills, and attitudes; associated competencies; and assessment information. Subsequently, they conducted local, national, and international workshops to verify appropriateness of content and supervision level before finalizing each EPA with additional expert and stakeholder review.

Results

Five pre-clerkship EPAs were developed: 1) information gathering, 2) information integration for differential diagnosis, 3) healthcare team communication, 4) information sharing with patients, and 5) resource identification.

Conclusions

Workshop participants accepted the constructs and associated content for all EPAs. Participants agreed on a single level of supervision (practice under reactive supervision) associated with each EPA for entry into clerkship, and tailored content breadth/complexity to fit this level. The development of these pre-clerkship EPAs indicates support for EPAs in setting a standard for pre-clerkship clinical experiences and entry into clerkships.

INTRODUCTION

Calls for medical education reform advocate for curricular designs that integrate didactic knowledge with experiential learning.¹ Medical schools strive to provide this integrated experience by imbedding in the pre-clerkship curriculum a variety of early clinical experiences such as preceptorship placements in the hospital or ambulatory clinic settings.^{2,3} Ideally, clinical preceptorships allow learning of clinical and reasoning skills by placing students in actual student-patient interactions in the clinical workplace.⁴⁻⁶ The richness of learning in the workplace depends on the degree of student engagement in workplace activities.⁷ Yet, preceptors, frequently volunteer faculty, are challenged to identify activities in which to integrate students into their clinical practices. Students are similarly unclear about their roles. Consequently, preceptorships may consist mostly of shadowing experiences rather than the desired hands-on clinical experiences.⁸⁻¹¹

Entrustable professional activities (EPAs) offer a potential solution by identifying work activities early students can be expected to perform. EPAs are aligned with workplace learning and place competencies in the context of practice.¹² Here multiple competencies are evaluated through the lens of specific activities a physician performs.¹³ By defining the educational goals and objectives of early clinical experiences in the language of professional activities, we provide students and preceptors with explicit guidance for students' roles. We can clarify what developmentally appropriate activities students can perform and how students may be effectively integrated into the preceptor's clinical workplace.

While EPAs have primarily been applied to graduate medical education (GME), we have argued for their applicability to undergraduate medical education.¹⁴ Also, EPAs particularly define expectations at transition points in medical training – at entry into residency, fellowship, and/or practice.^{13,15-19} Clerkship entry is an earlier key transition point. We therefore developed EPAs for pre-clerkship students to clarify competency expectations for students at clerkship entry.

Approach

To develop these EPAs, we first determined a level of supervision or entrustment with which to anchor the EPAs to ensure consistency. The supervision scale for EPAs includes five levels of supervision/entrustment.¹² EPAs for entry into practice are defined at level 4: learner may practice unsupervised. Since students will not be expected to perform clinical activities without supervision, we designed the EPAs for entrustment level 3: learner may practice under reactive supervision. For some activities this would mean that a student could complete the activity alone in the room with a patient, with the supervisor outside the room but immediately available.

Approaches to EPA development have commonly included the use of the Delphi or nominal group process.^{15,16,20-25} Both use experts to define what the EPAs should be, leading to a list of EPA titles. However, the real essence of an EPA is in its fully elaborated description,

which includes a detailed explanation containing limitations of the activity; expected knowledge, skills, and attitudes; associated competencies; and assessment information.^{26,27} While the tasks described in an EPA title may seem self-evident and require little explanation for a learner transitioning to practice, novices to the workplace, and those working with them, need explicit details to understand the specific circumstances and limitations of activities being asked of the novices. This complete information is required to implement EPAs for performance assessment.

The purpose of this paper is to report the novel methodology we used to develop fully described EPAs for clerkship entry. A full EPA description includes seven parts: 1) EPA title; 2) specifications and limitations; 3) required knowledge, skills, and attitudes; 4) link to existing competency framework; 5) information sources to assess progress; 6) methods to arrive at entrustment decision; 7) conditions and implications for entrustment.^{26,27} We emphasize the steps taken during development to ensure content validity. Standards set by the *Standards for Educational and Psychological Testing* for content-related validity state that the procedures in specifying assessment content should be described and justified with reference to the intended population and the construct the assessment is intended to measure.²⁸

We describe the methods and results of our multi-step process by each phase of the process, providing the rationale, data sources, and data analysis for each step. See Figure 1. In brief, the process consisted of development, sharing with stakeholders, and professional review repeated through several data-informed cycles. The process took approximately two years and all steps in the process were approved by the University of California San Francisco (UCSF) institutional review board.

PHASE I: IDENTIFICATION OF EPA CONTENT DOMAINS

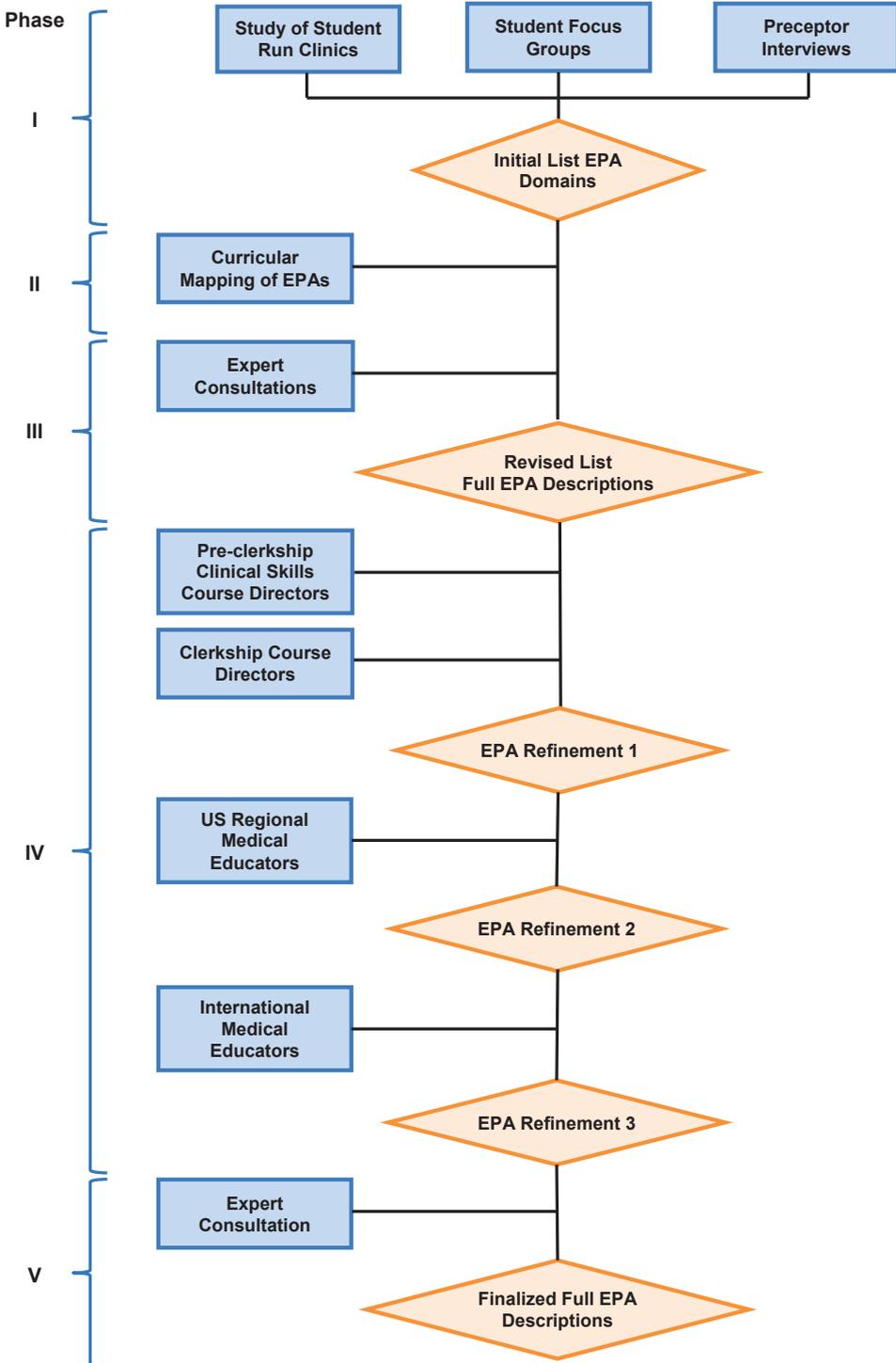
Rationale

The identification of EPA content domains should be based on demonstrated student capabilities. To determine what professional activities pre-clerkship students were capable of, and could feasibly be incorporated into the curriculum, we started with a study of pre-clerkship student roles and activities in UCSF's student run clinics (SRCs), that revealed students perform direct patient care activities such as histories and physical examinations, patient education, encounter documentation, and minor procedures (e.g. phlebotomy, vaccinations).²⁹ They also helped patients access local health programs and performed quality improvement activities.²⁹ We confirmed this information via preceptor interviews and student focus groups.

Methods

Between November 2012 and June 2013, we conducted 20-45 minute structured telephone interviews with preceptors in UCSF's pre-clerkship clinical course. We selected preceptors

Figure 1: Steps in the Development of and Collection of Content Validity Evidence for Pre-Clerkship EPAs



with demonstrated ability to incorporate students into the workplace. Seventy-one of 363 preceptors met this criteria with consistent high student ratings (over 3 academic years, 2009-2012) for provision of history-taking and physical exam opportunities and teaching effectiveness. To capture student activities across various clinical workplaces, we used purposive sampling to recruit 40 of the 71 preceptors who worked in outpatient clinics, emergency departments, and inpatient wards; in general or subspecialty practices; and cared for adult or pediatric patients. We asked the preceptors about patient care activities they have students perform and their ability to provide students with clinical skills practice opportunities.

We invited all second-year (MS2) and third-year (MS3) UCSF students to focus groups, and included the first respondents from each class. We conducted two 60-minute focus groups, one with MS2s who had recently completed their first pre-clerkship year and one with MS3s currently in their clerkships. We asked students to reflect on what they found most valuable in their preceptorship experiences, their ability to practice various clinical skills, and whether they could have engaged in additional learning or patient care activities.

All interviews and focus groups were audio-recorded, transcribed, and de-identified. One author (HCC) used the constant comparative method with open coding to analyze the transcripts for types of clinical workplace activities.^{30,31} Two authors (HCC, MM) triangulated these with activities described in the SRC study.²⁹

Results

Twenty-two of 40 preceptors responded, and 19 were interviewed. Eight students participated in the MS2 focus group and 3 participated in the MS3 focus group. Using the clinical workplace activities described from the SRC study, preceptor interviews, and student focus groups, we identified five initial EPA content domains: A) information gathering, B) information sharing with providers, C) information sharing with patients, D) patient advocacy and quality improvement, and E) information management for lifelong learning.

PHASE II: EPA CONTENT DOMAIN MAPPING AND CONFIRMATION

Rationale

To ensure relevance and adequacy of each EPA content domain, we mapped them to existing competency frameworks as recommended by ten Cate and Young for establishing credibility with stakeholders and providing a framework for observation and assessment.³²

Methods

We performed mapping between May and November 2013. First, we mapped the EPA content domains to the preceptorship objectives and pre-clerkship clinical course competencies. Then we mapped the domains to UCSF's graduation competencies and milestones. Finally, we mapped the EPA domains to GME EPAs from medicine¹⁸ and

pediatrics¹⁷ and the Association of American Medical Colleges (AAMC) Core EPAs for Entering Residency (CEPAER)¹⁵ when available in November 2013. Two authors (HCC, MM) independently mapped at each step and met to discuss and reconcile differences.

Results

We linked all existing curricular objectives and competencies to each of the five EPA content domains except “facilitate learning by giving, receiving, and applying feedback”; this was an important competency but not specific to, and therefore not linked to, any EPA content domain. We were also able to map the five EPA content domains to 10 of the 13 AAMC CEPAER¹⁵, 11 of the 16 medicine EPAs¹⁸, and 8 of the 16 pediatric EPAs¹⁷. Because our EPA content domains were of narrower scope, representing foundational and smaller units of activity than the GME EPAs, some of the domains mapped to multiple GME EPAs. Our mapping results confirmed the relevance of the pre-clerkship EPA content domains to current and future expectations of learners.

PHASE III: EPA CONTENT DESCRIPTION AND EXPERT CONSULTATION

Rationale

To be operationalized, the content of each EPA needs to be elaborated beyond its content domain to include a detailed delineation of the expected observable behaviors and the context for those behaviors. We developed comprehensive 7-part descriptions of each EPA using published guidelines noted above²⁷ and the assistance of an EPA expert.

Methods

During July to December 2013, using level 3 supervision (practice under reactive supervision), and guidance from the curricular mapping, we developed titles for each EPA content domain and delineated the scope of each EPA with specifications of the parameters or conditions limiting each activity. For instance, for the activity of gathering information from the history and physical examination of a patient, we limited the activity to types of patients appropriate for a pre-clerkship student (e.g. medically stable). We also identified the knowledge, skills, and attitudes needed for successful completion of each EPA. We then used the pre-clerkship course objectives to identify where students would learn, for instance, the required foundational science knowledge to support these clinical activities. Finally, we determined the sources of information for determining student progress, the conditions and methods for granting level 3 entrustment, and implications for the student once level 3 entrustment is granted. As we developed the comprehensive 7-part EPA description²⁷, we received expert consultation and iterative feedback from our EPA-expert author (OtC) regarding the structure, clarity, and adequacy of the descriptions. We also sought and received feedback on the clarity of our EPA descriptions from health professions educators working with our EPA expert at the University Medical Center Utrecht.

Results

Full detailed descriptions for each EPA were developed. (See Appendix A for an example). Upon review, we revised the EPA domains to improve their suitability for early learners. See Table 1. We separated generating a differential diagnosis and assessment and plan from information sharing into its own EPA. This makes explicit an important activity that naïve early learners may not recognize and emphasizes it as an entrustable contribution to patient care that can serve as a prerequisite for more advanced patient care activities. We also merged the last two EPAs (D and E) into one EPA. In early learners, the practice of information management is most often observable when applied to researching resources for patients or the healthcare team. Here, information management is also a patient advocacy and quality improvement behavior.

Table 1: Evolution of List of EPA Content Domains/Titles

Initial List of EPA Content Domains	Revised List of EPA Titles	Finalized EPA Titles
A. Information gathering	1. Information gathering from a cooperative patient in no distress with a common chief complaint and no complicated underlying medical problems	1. Gather information from a medically stable patient with a common chief complaint
B. Information sharing with providers	2. Integrate information gathered about the patient to construct an initial assessment and plan for common chief complaints	2. Integrate information gathered about a patient to construct a reasoned and prioritized differential diagnosis as well as a preliminary plan for common chief complaints
	3. Communication of information relevant to patient's care with other members of the health care team	3. Communicate information relevant to a patient's care with other members of the health care team
C. Information sharing with patients	4. Information sharing with a patient in no distress about the patient's diagnosis and/or management plan	4. Share information about the patient's care, including diagnosis and management plan, with a patient in no significant physical or emotional distress
D. Patient advocacy and quality improvement	5. Identify and share relevant resources to improve quality of patient care	5. Provide the health care team with resources to improve an individual patient's care or collective patient care
E. Information management for lifelong learning		

PHASE IV: ASSURANCE OF APPROPRIATE EPA CONTENT

Rationale

To ensure appropriateness of each EPA, we engaged internal and external subject matter experts to assess the specifications/limitations of each activity for correct level of complexity and alignment with expected student competencies. We opted to use focused workshop discussions to elicit in-depth feedback from diverse stakeholders in medical education. These workshops allowed us to explain the intended use of the EPAs and expected supervision/entrustment level, explore perspectives, understand concerns, and work collaboratively with workshop participants to refine content.

Methods

From January to April 2014, we held four content validation workshops: two local, one national, and one international. The first two workshops were at UCSF; one with pre-clerkship clinical course leaders and another with the clerkship curriculum committee. The third workshop was at the 2014 annual meeting of the AAMC Western Group on Educational Affairs (WGEA). The last workshop was at the 2014 Ottawa Conference, a biennial international medical education conference focused on assessment. See Table 2 for details about workshop participants, procedures, and outcomes.

All workshops were led by two authors (HCC, MM) and followed the same format. Up to two additional authors (AT, OtC, or PO'S) participated to provide small group facilitation. After a brief introduction including how the EPAs were developed and the expected level of supervision/entrustment, participants divided into small working groups, sorting themselves by background (clinician/non-clinician, UME/GME, institution) to ensure diversity in each group (see Table 2). Each small group focused on a specific EPA, discussed its title and detailed specifications/limitations, and provided written comments. Small groups were followed by large group discussion for each EPA. Finally, participants discussed whether there were EPAs missing. Participant and small group notes were collected. All workshops were audio-recorded and workshop facilitators took additional notes. All information was compiled and reviewed by HCC and MM.

Results

Based on the local workshops, we refined the EPA title and detailed specifications/limitations, including a substantive change in language, for EPA #5. Smaller refinements followed every subsequent workshop. Table 2 details the refinement process. Consensus groups of local, national, and international workshop participants did not identify missing EPAs, though some participants suggested an EPA for common procedures.

Table 2: Workshops Providing Content Validity Evidence

	Workshop 1: Pre-clerkship Clinical Skills Course Directors	Workshop 2: Clerkship Curriculum Committee	Workshop 3: National Medical Education Conference	Workshop 4: International Medical Education Conference
Characteristics	<ul style="list-style-type: none"> 60 minutes 7 participants 4 departments 	<ul style="list-style-type: none"> 45 minutes 18 participants (including 2 students) 7 departments 	<ul style="list-style-type: none"> 90 minutes 26 participants 12 US schools and 1 international school 	<ul style="list-style-type: none"> 90 minutes 23 participants At least 15 schools from 7 countries (US, Canada, UK, Germany, Switzerland, New Zealand, Thailand)*
Small groups	<ul style="list-style-type: none"> 2 small groups Each group with at least 1 clinician and 1 non-clinician 2-3 EPAs/group 	<ul style="list-style-type: none"> 5 small groups Each group with at least 1 clerkship director 1 EPA/group 	<ul style="list-style-type: none"> 5 small groups 4 groups with at least 3 schools and 3 countries represented* 1 EPA/group 	<ul style="list-style-type: none"> 5 small groups 4 groups with at least 3 schools and 3 countries represented* 1 EPA/group
EPAs provided	Revised list			
General feedback	<ul style="list-style-type: none"> Liberalize activity parameters (increase expectations) Clarify EPA 5 	<ul style="list-style-type: none"> Add interpreter use Clarify EPA 5 	<ul style="list-style-type: none"> Increase emphasis on clinical reasoning, basic science application ?add EPA for systems-based practice and procedures Refine language and parameters 	<ul style="list-style-type: none"> Exclude sensitive parts of exam (e.g GU exam) ?add EPA for systems-based practice and procedures Refine language and parameters
Revisions made	<ul style="list-style-type: none"> Updated language in EPAs (major rewrite of EPA 5) Clarified parameters, in many cases liberalizing them 			
Resulting EPAs	Refinement 1		Refinement 2	Refinement 3

*Worksheet with participant demographics from one table was lost from the conference room, so tally of schools and countries do not include that table.

PHASE V: FINALIZATION OF EPA CONTENT WITH EXPERT AND STAKEHOLDER REVIEW

Rationale

Because the EPA descriptions underwent several refinements, we performed final reviews with our expert-EPA consultant as well as local stakeholders to ensure adherence to EPA principles and appropriateness and alignment of content with curricular expectations.

Method

In May 2014, our expert-EPA consultant author (OtC) reviewed the refined EPA descriptions for conceptualization, wording and semantics, resulting in the final version of the EPA descriptions. This version was sent to UCSF's pre-clerkship clinical course leaders and clerkship curriculum committee members for review and approval in June 2014.

Results

Our expert-EPA consultant revealed that our EPAs were written with a learner focus similar to that seen in typical competency language (what a learner will do). With his guidance, we reframed the language to focus on the activity/unit of work within a specific context. We made no other alterations to the EPAs. Local stakeholders approved the final version of EPAs for implementation in Fall 2014. See Table 1 for titles of the finalized EPAs and Appendix A and B for each EPA's specifications/limitations.

DISCUSSION

We described the methodology we used to identify and develop detailed descriptions of five EPAs that are core for entry into clerkships. These EPAs clarify the developmentally appropriate activities that pre-clerkship students can perform to allow their engagement in the clinical workplace. They are mapped to local curricular expectations and aligned with EPAs developed by external agencies. They are also supported by content validity evidence from both internal and external subject matter experts. Our detailed descriptions and validity evidence may allow others to operationalize these EPAs to improve early clinical experiences at their own institutions.

Workshop participants readily accepted the constructs and content domains for the five EPAs. They agreed on the level of supervision (practice under reactive supervision) and helped to tailor the EPA content (expanding or limiting breadth/complexity of the detailed specifications and limitations) to fit this level. Despite variable pre-clerkship clinical preparation across institutions, participants were able to come to agreement on expectations. Participants from some institutions expressed interest in a procedures-oriented EPA. This highlights that these EPAs are a core set. Individual institutions may choose to include additional elective EPAs such as one related to procedures to suit institution-specific objectives or student needs.

In addition, the sources of information used to arrive at an entrustment decision will likely differ based on local resources and circumstances. For those reasons we do not include any information specific to implementation at UCSF in the full EPA description in Appendix A. We encourage institutions interested in implementing these core pre-clerkship EPAs to complete parts 3, 4a, 4b, 5, and 6 of the EPA descriptions based on their local curriculum. Discussions around the information sources for assessment should look beyond existing assessments and address the validity of assessments for making entrustment decisions. We recommend that multiple and preferably different types of information sources (e.g. faculty evaluation, multi-source feedback, standardized-patient exams) be used to gauge progress and that entrustment decisions be based on the input of more than one person or time point (e.g. three faculty members recommending entrustment).

A valuable outcome of the EPA development process was the promotion of discussion among the pre-clerkship and clerkship faculty, who may have differing expectations of students' clinical skills.³³ At our institution, it created consensus among the faculty for clerkship entry expectations. Now these expectations can be explicit and clearly laid out for students. The framing of student roles and responsibilities as clinical workplace activities also generated valuable conversations about the importance of learning through participation and the ability of early students to contribute to the care of patients. Through careful considerations about the levels of supervision, meaning of entrustment, and detailed specifications/limitations for each activity, the faculty reached consensus on which tasks and in what circumstances early students could safely engage in authentic patient care activities. This can begin to alter faculty expectations and their perceptions of early students from that of potential burden to contributors in the clinical workplace.

We began this project a year before the AAMC CEPAER were publicly available.¹⁵ Later, we found the CEPAER too broad in scope relative to pre-clerkship students' capabilities. EPAs that are too broad may prevent pre-clerkship students from assuming the degree of responsibility desired for legitimate participation in the workplace, and our primary goal was to define EPAs that could promote student participation. It is also unclear whether pre-clerkship students should be capable of performing each of the 13 CEPAER to a small degree or only a subset of the CEPAER with the expectation of expanding their skills during clerkships. Therefore we elected not to work backwards from the CEPAER but to work forwards based on evidence of actual pre-clerkship student capabilities. The ability to link or nest our pre-clerkship EPAs up to the CEPAER, as demonstrated by our mapping process, reinforces their content validity and allows their use with the CEPAER.

We acknowledge that EPAs should not be too granular.³⁴ However, for pre-clerkship students, seemingly small tasks can be experienced as major responsibilities that will only later become part of a broader responsibility. For instance, EPA#2, "integrate information gathered about a patient to construct a reasoned and prioritized differential diagnosis as well as a preliminary plan for common chief complaints", becomes part of the broader resident task of "manage care of patients with acute common diseases".¹⁸ We deliberated EPA#2's validity since it is an activity that would not necessarily be prohibited without supervision.

We retained it, deciding that for very junior learners, the activity should be conceptualized and presented as a responsibility that contributes to patient care. This evolution of small activities into broader responsibilities adds to the holistic sense of growth in clinical performance.

It is important to note where our EPAs may have digressed from recommendations in the literature. As is visible from Table 1, the EPA titles increased in length during our development process, despite the recommendation to keep titles short.^{34,35} We felt that adding limitations to the title, rather than mentioning them only in the elaborated EPA description, would emphasize their appropriateness for pre-clerkship students and help prevent any misunderstandings or concerns that might occur upon initial encounter with these EPAs. Also EPA#5 (provide the health care team with resources to improve an individual patient's care or collective patient care), is similar to and incorporates elements of two AAMC CEPAER (form clinical questions and retrieve high-quality evidence to advance patient care, identify systems failures and contribute to a culture of safety and improvement). Ten Cate has questioned whether these two AAMC CEPAER are true EPAs.³⁵ However, EPA#5 differs from the two AAMC CEPAER in meeting the definition of an EPA in two respects: 1) it is a discrete task that relates back to care of a patient rather than an ongoing habit and 2) students can advance to higher levels of autonomy for this task.³⁴

There are limitations to the methodology we used. First it was a lengthy process, taking almost two years. However, basing the EPAs on evidence of demonstrated pre-clerkship student capabilities facilitated their acceptance by various stakeholders. This was particularly important since many do not appreciate the extent to which pre-clerkship students are capable of engaging in patient care activities. Second, our use of workshops restricted the number of content experts we could engage in our process. It also limited our ability to control who was engaged at the national and international levels as participation was based on conference attendance. However, we did specifically hold our workshops at meetings we knew would be attended by individuals experienced in medical education. Both workshops were well attended. We kept track of our participants' educational roles, clinical background, and institutions; had them work in diverse groups; and checked for broad representation of institutions and regions in evaluating the workshop feedback. In fact, we found the workshop approach to collecting content validity evidence highly advantageous for allowing rich discussions and fine-tuning of the detailed specifications and limitations of expected activities – something that would be more difficult to achieve using strategies such as the Delphi process or nominal group technique. Third, the validity evidence that we collected focused entirely on content validity. Additional validity evidence regarding use in student assessment is required. The EPAs are being implemented locally and future work will focus on this.

We developed full EPA descriptions for five core EPAs for clerkship entry following published guidelines for EPA development, and with special attention to validity standards for educational testing. We endorse their use by other programs anticipating that they can

provide explicit guidance for the engagement of pre-clerkship students in clinical workplace activities with attention to patient safety.

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Appendix A: EPA #1 Showing Categories of Information Included in its Full Description

For space considerations, only information for the title, detailed specifications and limitations, and alignment with EPAs from external agencies is shown.

1. EPA #1 title	Gather information from a medically stable patient with a common chief complaint
2. Specifications and limitations	<p>Use the chief complaint to gather a history and perform a complete or focused physical exam appropriate to the context, within a reasonable timeframe (i.e. considering setting, complexity) in the following circumstances:</p> <ul style="list-style-type: none"> • The patient has a common chief complaint (e.g. earache, headache, cough, shortness of breath, abdominal pain, vomiting/diarrhea, back pain, dysuria, fever, or rash) • The patient may have underlying medical problems (e.g. chronic conditions such as hypertension, COPD/asthma, or diabetes) • The physical exam does not include the genitourinary, rectal, or female breast exam • The patient is medically stable and is not in significant physical or emotional distress as determined by a supervising clinician • The setting can be in the outpatient clinic, emergency department, or inpatient ward (but not intensive care units) • The patient is mostly cooperative (e.g. non-combative, adult or child greater than 7 years of age), relatively cognitively intact (e.g. non-sedated, not delirious or demented or psychotic) <ul style="list-style-type: none"> • History could be obtained from a cooperative family member of patient (e.g. parent of a child) • Physical exam where the patient is able to ambulate/transfer him/herself • Interactions are conducted in a language in which both parties are fluent or through a qualified interpreter.
3. Specific knowledge, skills, and attitudes needed to execute the EPA well	List of knowledge, skills, and attitudes with links to where in the local curriculum a student would learn them
4a. Link to preceptorship objectives and clinical skills competencies	List of associated local preceptorship objectives and clinical skills competencies
4b. Link to graduation competencies and milestones most applicable to this EPA	List of local graduation competencies and milestones sorted by ACGME competency domain
4c. Link to EPAs from professional organizations	<p><u>AAMC CEPAER</u></p> <ul style="list-style-type: none"> • Gather a history and perform a physical examination <p><u>GME</u></p> <ul style="list-style-type: none"> • Manage care of patients with acute common diseases across multiple care settings (medicine) • Manage patients with acute, common, single system diagnoses in an ambulatory, emergency or inpatient setting (pediatrics)

<p>5. Information sources to gauge progress</p>	<p>List of local learner assessment sources</p>
<p>6. Method for formal entrustment decision</p>	<p>Description of number of times ability needs to be demonstrated under what circumstances locally</p>
<p>7. Conditions and implications of entrustment for the student</p>	<ul style="list-style-type: none"> • Student will be allowed to (without in-room supervision) gather information from history and physical examination of medically stable patients with common chief complaints to support his/her role as a primary care provider in the outpatient clinic, emergency department, or inpatient ward. • The supervising clinician is not with the student but is nearby and available, and will recheck the student's findings

Appendix B: EPAs #2 to #5 with Titles and Detailed Specifications and Limitations

EPA #2	
Title	Integrate information gathered about the patient to construct a reasoned and prioritized differential diagnosis as well as a preliminary plan for common chief complaints.
Specifications and limitations	<p>Integrate information from the history and physical exam in the following circumstances and with the following characteristics:</p> <ul style="list-style-type: none"> • The patient has a common chief complaint (e.g. earache, headache, cough, shortness of breath, abdominal pain, vomiting/diarrhea, back pain, dysuria, fever, or rash). • The patient has up to three significant, stable medical problems (e.g. controlled hypertension, asthma, or diabetes). • The differential diagnosis and plan: <ul style="list-style-type: none"> • Are based on the patient's history of present illness • Incorporate factors from the patient's past medical, social, and family histories, and the patient's medical record (e.g., considers a patient's travel history in the differential diagnosis of fever.) • Incorporate foundational science knowledge (e.g. pathophysiology or molecular mechanisms of disease) • The differential diagnosis includes more than one possible diagnosis, and is prioritized and supported by clinical reasoning. • The plan includes suggestions for next steps as appropriate (e.g. commonly ordered diagnostic tests/imaging and/or initial treatment, medications, or interventions).

EPA #3	
Title	Communicate information relevant to patient's care with other members of the health care team
Specifications and limitations	<p>The following conditions and limitations apply:</p> <ul style="list-style-type: none"> • Findings following a patient encounter (e.g. patient interview, physical exam, chart review, test results, etc) are organized and prioritized and then communicated via: <ul style="list-style-type: none"> • Oral case presentation using an accepted standard format • Written documentation using an accepted standard format (e.g. EHR or other) • The setting can be in the outpatient clinic, emergency department, or inpatient ward (but not intensive care units) • Encounters may include also include interactions outside the clinical setting (e.g. home visit, telephone call, email correspondence, etc.) • Findings are presented and discussed with the supervising clinician before sharing with other members of the health care team (e.g. nursing staff, consulting service, etc.)

EPA #4	
Title	Share information about the patient's care, including diagnosis and management plan, with a patient in no significant physical or emotional distress.
Specifications and limitations	<p>The following conditions and limitations apply:</p> <ul style="list-style-type: none"> • The information to be shared is straightforward and has been vetted by the supervising clinician. <ul style="list-style-type: none"> • Information can include diagnosis, management plan, next steps, patient education, anticipatory guidance, or health coaching. • The discussion is anticipated not to surprise or provoke undue anxiety in the patient. (e.g. counseling patients on eating habits, medications, or hgb A1C but not providing cancer diagnosis). • The patient is medically stable and has a common acute or chronic diagnosis that is not immediately life threatening, critical, or emergent. • The patient is generally cooperative (non-combative, older child or adult), relatively cognitively intact (non-sedated, not delirious or demented or psychotic). <ul style="list-style-type: none"> • Communication may be with a family member of the patient (e.g. parent of a child) • Communication is in language in which the provider and patient are both fluent or through a qualified interpreter. • Sharing information includes checking the patient's understanding of the information conveyed and seeking assistance from a supervising clinician if there is notable patient surprise or anxiety.

EPA #5	
Title	Provide the health care team with resources to improve an individual patient's care or collective patient care.
Specifications and limitations	<p>Information that has been researched and appraised may only be shared with permission of the supervising clinician. Resources include:</p> <ul style="list-style-type: none"> • Information from the medical literature such as practice guidelines and possible treatment options from clinical reviews and studies weighted by quality and relevance of evidence • Patient education materials from the electronic medical record system or other vetted, evidence-based sources (e.g. Up To Date Patient Handouts, clinic-specific information, instructions on how to take medications). • Local, community-based resources for support of patients and/or patients' families (e.g. non-profit organizations, support groups, food bank, hotline numbers). • National organizations for information, support, and advocacy for patients and/or patients' families (e.g. American Heart Association, American Cancer Society, Cystic Fibrosis Foundation). • Expert opinion related to a given problem from other members of the health care team (e.g. medical or nurse specialist, pharmacist, nutritionist, social worker, etc)

Chapter 5

Sequencing Learning Experiences to Engage Different Level Learners in the Workplace: An Interview Study with Excellent Clinical Teachers

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ABSTRACT

Purpose

Learning in the clinical workplace can appear to rely on opportunistic teaching. The cognitive apprenticeship model describes assigning tasks based on learner rather than just workplace needs. This study aimed to determine how excellent clinical teachers select clinical learning experiences to support the workplace participation and development of different level learners.

Methods

Using a constructivist grounded theory approach, we conducted semi-structured interviews with medical school faculty identified as excellent clinical teachers teaching multiple levels of learners. We explored their approach to teach different level learners and their perceived role in promoting learner development. We performed thematic analysis of the interview transcripts using open and axial coding.

Results

We interviewed 19 clinical teachers and identified three themes related to their teaching approach: sequencing of learning experiences, selection of learning activities and teacher responsibilities. All teachers used *sequencing* as a teaching strategy by varying content, complexity and expectations by learner level. The teachers initially *selected learning activities* based on learner level and adjusted for individual competencies over time. They identified *teacher responsibilities* for learner education and patient safety, and used sequencing to promote both.

Conclusions

Excellent clinical teachers described strategies for matching available learning opportunities to learners' developmental levels to safely engage learners and improve learning in the clinical workplace.

INTRODUCTION

Of the many models for thinking about learning in the clinical setting, one of the most pervasive is the apprenticeship model in which learning occurs through participation. In apprenticeships, learning is situated in the context of the workplace and triggered by engagement in work activities. The assumption is that apprentices are able to inherently learn all that was necessary for the job primarily by doing.^{1,2} In the past few decades, attention has shifted towards increased structuring of these learning experiences in the clinical workplace through strategies such as structured feedback, regular workplace-based assessments (mini-CEX), and portfolios. Consistent with this trend is Allan Collins' introduction of the cognitive apprenticeship, a variation of the traditional apprenticeship model.² In contrast to traditional apprenticeship, the cognitive apprenticeship takes a more deliberate approach to promote the development of cognitive skills needed for practice. It focuses on the content required for expertise, social characteristics that impact learning (e.g. real-world context), teaching strategies to promote learning, and principles for ordering learning activities. Learners are given tasks based on what the learner should be learning rather than just what the workplace needs done. This more deliberate matching of activities to learner needs has also been described as supported participation, which is a key to clinical workplace learning.^{3,4} To accomplish this, both Collins and Dornan argue that curriculum leaders need to developmentally order or sequence learning activities in the curriculum.^{2,5} This includes increasing the complexity and diversity of activities over time, and introducing whole tasks before breaking down into part-task activities.² Dornan and others further argue that individual teachers also have to identify ways to enable learner participation in workplace activities appropriate to their level of development or training.^{3,6}

Due to increasing emphasis on competency-based education, learner-centered teaching, and early clinical experiences, clinical teachers, more than ever, need to support the clinical learning and developmental progression of a wider range of individual learners. Clinical teachers must have the skills to assign workplace activities that provide the most effective learning opportunities for each learner. Yet promotion of learning in the clinical workplace is already demanding and complex. Challenges include the unpredictable and opportunistic nature of clinical learning and the need to engage multiple level learners.⁷ Indeed, the problems most commonly identified with teaching and learning in the clinical setting include teaching pitched at the wrong developmental level and the lack of learner participation in clinical workplace activities.⁸ Ramani and Leinster note that clinical teachers can help different level learners learn from the same patient by choosing different teaching goals and focusing on specific learning activities for the different level learners.⁷ Yet little is known about how clinical teachers accomplish those goals.

Studies and assessments of excellent teaching in clinical settings have primarily focused on the characteristics (e.g. knowledge, enthusiasm, role model) or general skills (e.g. feedback, communication) of the teacher and have generally overlooked the teacher's role in choosing opportunities for effective learning.⁹⁻¹² Studies of teaching practices in clinical settings that apply Collins' cognitive apprenticeship model have focused on the model's teaching

strategies, but not on the challenge of engaging different level learners in the clinical workplace.¹³⁻¹⁶ The purpose of this study is to determine how excellent clinical teachers approach the selection of learning experiences in the clinical context to support the workplace participation and developmental growth of different level learners.

METHODS

Design

This was a single institution qualitative interview study of teaching practices among excellent clinical teachers. We selected a grounded theory approach from a constructivist perspective in order to develop an understanding and model for teacher selection of learning experiences for different level learners in clinical workplaces. By selecting a constructivist perspective, we acknowledge that teachers may conceptualize this process in different ways and that our understanding is an interpretive one.¹⁷⁻¹⁹

Context

We conducted this study at the University of California San Francisco (UCSF) School of Medicine, and with approval of the UCSF institutional review board. The UCSF undergraduate and graduate medical education programs are consistently ranked among the best in the United States.²⁰ UCSF has an Academy of Medical Educators (AME) where the members are selected via an external review process based on their excellence in direct teaching and accomplishments in an additional area of medical education such as curricular development, advising/mentoring, educational administration/leadership, or educational research. AME members exemplify the best teachers at UCSF and represent 4-5% of the faculty across all core teaching sites, departments, and clinical and classroom settings.²¹

Participants

We used purposeful sampling methods to select participants who were most likely to provide the richest information about the selection of clinical learning activities for multiple levels of learners.^{17,22} We defined clinical teachers as physician faculty members who directly supervised learners in the clinical environment and who cared for patients jointly with the learner. These teachers were responsible simultaneously for both medical students and residents/fellows who were on clinical rotations for their individual training programs with primary learning goals relating to patient care competencies. We considered medical students at any level of training, but primarily clerkship students, as junior learners; interns as intermediate or more advanced learners; and senior residents/ fellows as senior learners.

We first used criterion sampling to pick participants who met our pre-specified criteria of: (1) membership in the UCSF AME, (2) practicing physician, and (3) taught learners of multiple levels of training in the clinical setting.^{17,22} Seventy-seven clinical teachers met these criteria. We then used theoretical sampling to select individuals based on whom we predicted would add new and varying perspectives on teaching.^{17,19,23} For instance, we anticipated that

clinical teachers from different specialties (e.g. surgery versus psychiatry) or who work in dissimilar clinical settings (e.g. intensive care unit versus outpatient clinic) might have different approaches. Therefore, we specifically sampled from a variety of specialties as well as a range of inpatient and outpatient clinical settings. When emerging themes from early interviews suggested a potential difference in perspective among teachers from procedural specialties, we explicitly recruited additional participants from procedural specialties to further explore their perspectives. We accomplished this by sending invitations to participate in individual interviews in multiple waves, selecting who was invited in each successive wave based on who had agreed to be interviewed. We stopped our recruitment when we reached theoretical saturation, at which point invitations to 46 of the 77 current physician AME members had been sent.

Instrument

Because we wanted to explore teacher selection of clinical workplace activities for different level learners, which may be a deliberate approach to structuring clinical learning, we used the framework of Collins' cognitive apprenticeship and curricular sequencing² to inform the development of an interview guide. To allow more open discussion, we did not include specific terminology from those frameworks in our interview questions or probes. The guide for our semi-structured interviews included the following questions: (1) Please describe your approach to teach learners at different levels in a clinical setting. (2) How did you develop your current approach to work with learners at different levels? (3) What role, if any, do you think faculty play in promoting the developmental progression of learners in the clinical settings? How might the faculty do a better job of this? (4) Do you have other comments about your teaching experiences with learners at different levels? We piloted the interview guide with experienced teachers who were not in the AME and made minor edits to the probes before using the guide with study participants.

Procedure

Two authors (BK and SF), who were non-AME junior clinician educators, trained in interview methods, conducted the semi-structured interviews. As non-AME members, they were not well known to the study participants and could function as outsiders.¹⁷ However, they were also clinical teachers with insider knowledge of the teaching roles and contexts of their interviewees. Each interviewed approximately half of the study participants either in-person or by telephone between January 2012 and March 2013. They debriefed their interviews with a third author (HCC) who, as an AME member meeting study criteria, was fully positioned as an insider. This facilitated understanding and appreciation of complexity and patterns present in the data while avoiding an insider's influence on the data collection. Interviews averaged 30 minutes in length (range 15 to 50 min). All interviews were audio-recorded and the audio files were transcribed verbatim by an external service and de-identified.

Data Analysis

Consistent with our grounded theory approach, we carried out inductive thematic analysis of our data using an iterative process during and after data collection. In inductive thematic analysis, themes are not imposed, but emerge naturally from the data.²³ Though we had a cognitive apprenticeship and curricular sequencing framework in mind when developing our interview guide, we took this open approach to our data analysis to allow for emergence of potential additional elements and concepts. To ensure analytical rigor, we used multiple coders for investigator triangulation.¹⁷ After familiarizing ourselves with the transcripts, the three authors who are clinical teachers (HCC, BK, and SF) performed initial open coding of the same six randomly selected transcripts to identify codes. We compared our coding lists and reconciled differences. We developed a codebook for thematic analysis and two authors (either HCC and BK or HCC and SF) independently applied it to all transcripts for open and axial coding.^{17,24} The authors met and discussed all transcripts and reconciled any discrepancies.

We then organized the emergent themes using the sensitizing concepts of cognitive apprenticeship and curricular sequencing. Sensitizing concepts are concepts brought to data analysis to allow for a frame of reference in organizing and reporting the emergent themes.²³ Using the organizing framework of cognitive apprenticeships and curricular sequencing, one author (HCC) took the lead in further abstracting, organizing, and synthesizing the themes into a cohesive model grounded in the data. To maintain reflexivity, these final phases of analyses involved discussions with the larger study team.¹⁷ The three non-clinician team members (PO'S, AT, and OtC), one of whom was from outside UCSF (OtC), functioned as outsiders to provide diverse perspectives and challenge assumptions. They were in agreement with the model and themes identified.

We used Dedoose Version 4.12.4 (<http://www.dedoose.com>) for our data organization and analyses. As part of our analyses, we looked at frequency of codes, co-occurrence of codes, and stratification of codes by years of teaching experience. We reached saturation within our sample; we did not discover new codes or themes despite additional sampling of clinical teachers from a variety of specialties and clinical settings. Also, the amount of data we gathered was sufficient to inform our understanding of teacher selection of learning experiences for different level learners.^{19,25}

RESULTS

Of the 46 clinical teachers invited, 20 responded; one declined and we interviewed all 19 who agreed to participate. They averaged 18 years (range 6-33 years) of teaching experience among them. All taught both medical students and residents, and more than a third of them also taught fellows. They were 58% (11) men, represented 10 specialties and taught in diverse clinical settings. See Table 1 for details.

Table 1: Demographics of Study Participants

	Participants <i>n</i> = 19
Gender	
Female	8 (42%)
Male	11 (58%)
Specialty	
Procedural (<i>anesthesia, obstetrics/gynecology, otolaryngology, surgery</i>)	5 (26%)
Non-procedural (<i>dermatology, family medicine geriatrics, medicine, pediatrics, psychiatry</i>)	14 (74%)
Clinical setting ^a	
Outpatient clinic or emergency room	13 (68%)
Inpatient ward, nursery, or nursing home	13 (68%)
Intensive care unit or operating room	5 (26%)
Location	
County hospital	4 (21%)
Tertiary care hospital	9 (47%)
Veteran's hospital	6 (32%)
Teaching Experience	
≤ 10 years	5 (26%)
11–20 years	7 (37%)
≥ 21 years	7 (37%)

^aMost participants taught in more than one clinical setting

While not a theme of focus in this study, the clinical teachers provided a rich description of the clinical context in which they taught. They described the relative lack of flexibility in the clinical teaching environment. For the most part, they felt they had no control over which patients were available or the difficulty of the patient case and therefore had no ability to design the content of the learning experience. “Mostly [learners] just get who they get and then they’re sort of just forced – and we’re forced – to make it work from there.” (participant-11)

The teachers then described how they worked with different level learners within this context. We were able to identify three themes related to their teaching approach: (1) sequencing of learning experiences, (2) selection of learning activities, and (3) teacher responsibilities. These themes appeared across specialties; our initial perception of potential differences between teachers from procedural and non-procedural specialties was not borne out. Table 2 lists the themes, subthemes, and additional participant quotes.

Sequencing of Learning Experiences

To manage the relatively fixed clinical contexts, all clinical teachers interviewed described deliberate ordering or sequencing of clinical learning experiences in order to adapt these experiences for learners of different levels. None of the teachers relied on sequencing as specified by the curriculum alone. Increasing years of teaching experience was associated

Table 2: Strategies for Supporting the Workplace Participation and Developmental Growth of Learners at Different Levels

Strategy	Suggestions for Practice	Participant Descriptions
Sequencing of Learning Experiences Adjust Teaching Content	<ul style="list-style-type: none"> • Choose different goals and focus content of teaching based on learner level <ul style="list-style-type: none"> - Junior learners: clinical presentations of common problems, pathophysiology, clinical reasoning, other generalizable skills (e.g. approach to anemia, conceptual framework for risk assessment, mechanics of oral presentation) - Mid-level learners: patient management, advanced communication skills (e.g. challenging situations), clinical decision-making - Senior learners: evidence-based medicine, anticipation of outcomes, team leadership and management skills, teaching skills 	<p>"With the medical students I try to focus...more on the underlying pathophysiology...At the intern level...I...focus...more on acute management...as well as contingency planning...like...what are you gonna do if this happens...And with the R3...I do more team management teaching..." (participant-16)</p> <p>"When I'm rounding with a fellow...I might ask: So you want to start this drug, what's the evidence for it? How did you make that decision to choose to get that diagnostic study?...Or, if we were to do that, what outcome would you anticipate?" (participant-7).</p>
Consider Case Complexity	<ul style="list-style-type: none"> • Choose cases with different levels of complexity for different level learners <ul style="list-style-type: none"> - Junior learners: straightforward medical problems (e.g. typical asthma, gastroenteritis/ dehydration), low complexity procedures, situations with little or no communication or psychosocial issues - Senior learners: complicated cases with nuances requiring advanced clinical judgment • Provide scaffolding to help learners manage inherent complexity <ul style="list-style-type: none"> - Junior learners: break down tasks into smaller parts (e.g. focus on history or part of physical exam, perform part 2 only of procedure), offer support (e.g. tips for documentation, doing the exam together) 	<p>"...I'll try to select the cases that are the most paradigmatic...so that it reinforces in real time, in the student's mind, what a patient with a [congestive heart failure] exacerbation ...of...end-stage liver disease looks like. So, I'll try to be very intentional about creating opportunities for early learners to imprint their learning on a classic case." (participant-2)</p> <p>"I think about what I want them to learn, I think about what patients might best exemplify that, without any confounding complexities to it, and then I think about what the interaction would be like for the student, and whether that patient and parent combination will enhance the student's ability to learn what I want them to learn, or get in the way." (participant-19)</p> <p>"What I tend to do when someone's first learning...is to break the procedure into steps...even a relatively simple procedure, I still don't have them do the whole thing at once." (participant-6)</p>
Tailor Expectations	<ul style="list-style-type: none"> • Have graduated expectations for learners <ul style="list-style-type: none"> - Senior learners: greater responsibility and autonomy, increased efficiency, management of high patient volumes, effective functioning within systems, evidence-based practice, supervision and teaching of others 	<p>"I'm not in a position to change what a sub-intern...or what an R2 is asked to do by the system. I am in a position to...expand...or narrow the spectrum of my expectations for them." (participant-3)</p> <p>"The fellows...it's more of a level of judgment about when and what procedures to do, and pushing them more about how they're deciding on the plan of care for that patient, as well as watching them supervise the residents." (participant-15)</p>

Selection of Learning Activities	
Assess Developmental Level	<ul style="list-style-type: none"> Assess developmental level of learners <ul style="list-style-type: none"> Ask about learner's level of training, prior experiences/background Observe learners' presentations and interactions with patient Use probing questions and have learners articulate their thinking Build or promote continuity with learners whenever possible <ul style="list-style-type: none"> Have junior learners work with the same senior learners on their teams (e.g. schedule shifts or take call with the same senior) Feed forward information on learners' learning needs and development to the next teacher
Encourage Continuity	<ul style="list-style-type: none"> Build or promote continuity with learners whenever possible <ul style="list-style-type: none"> Have junior learners work with the same senior learners on their teams (e.g. schedule shifts or take call with the same senior) Feed forward information on learners' learning needs and development to the next teacher
Build Challenge	<ul style="list-style-type: none"> Consider how far or in which directions to push learners <ul style="list-style-type: none"> Choose learning activities at learners' growth edges to promote growth Provide feedback with specific suggestions for reaching the next level of development
Teacher Responsibilities	
Balance Teaching and Clinical Responsibilities	<ul style="list-style-type: none"> Balance learner participation with patient safety by appropriately matching the learning activity to learner level <ul style="list-style-type: none"> Assess the learner's developmental level Consider a safe amount of challenge to build into activity Structure the available patient case or learning opportunity to match the learner level by varying focus on content, managing complexity, and adjusting expectations

"I can do sort of a mini-assessment of where I think each learner is in relationship to that benchmark [for level of training], and then try to bring them up to speed or push them to the next level." (participant-2)

"Our biggest impact is when we're not starting new with each person, but when we know where they are, where they've been, because then we kind of gently push them or guide them into the next step and have appropriate expectations." (participant-11)

"We as attendings sign out to each other...not just the patients but the [learners] on the team and what areas various people are working on." (participant-16)

"So one approach is establishing in my mind what the goals and expectations are for the learner at their level of training...The other side is more in-the-moment trying, based on my knowledge of...that individual learner, to target educational activities to maximize their learning on a particular day or with a particular patient. So it is both a big picture over the trajectory of time I work with learners, as well as a day-to-day, hour-to-hour almost moment-to-moment calibrating of activities that ideally target learners' needs and goals." (participant-9)

"So I'm very actively engaged in...moving people up to speed because I assume once we've [accepted the learner], we've made a contract with them that at the end of this time, they have to be a functional [physician]. And my job is to make them a functional [physician], and if I can't do that, then I'm not doing my job." (participant-14)

"My role is to ensure that the outcome is optimal, that care is safely delivered, with whatever level of [learner]...who's assigned to assist me." (participant-10)

"Well, first of all, it's a patient safety issue, so I'm never going to push [the learners to] where they're not safe with a patient." (participant-17)

with more descriptions of sequencing practice. The teachers sequenced learning experiences using three keys factors: content, complexity, and expectations.

Content

The clinical teachers varied the type of teaching content by the level of learner. For junior learners, they focused on teaching about common problems or skills. “I’m generally looking for...patients with bread-and-butter problems...and then more acute but common problems.” (participant-11) “I’m trying to contextualize what they’re learning so that it can be useful to any field they go into.” (participant-6) They emphasized knowledge of pathophysiology and clinical presentations (e.g. expected physical exam findings), and skills in basic communication (e.g. rapport building) and clinical reasoning. They also initially focused more on the mechanics of a skill – for instance whether all sections of a note are present and whether contents are appropriately categorized rather than the ability of the note to convey relevant information. For the more advanced learners, the teachers focused on knowledge of treatment and patient management plans, more advanced communication skills, and clinical decision-making skills. For senior learners, the focus shifted to learner application of evidence for management decisions, ability to anticipate outcomes, and leadership and teaching skills.

Complexity

Clinical teachers preferentially chose less complex patients for junior learners. This included cases which were less complicated procedurally or medically, and situations with less complicated communication (welcoming, cooperative, cognitively intact patients) or psychosocial issues for early learners. They reserved more complicated cases with “gray zones” and nuances requiring advanced clinical judgment for more senior learners. In situations where the problem was inherently complex, the teachers provided scaffolding to help learners prepare for or manage the complexity. They broke things down into manageable parts and limited the tasks given to the learner. “It’s actually quite remarkable the...steps that you can take a very junior trainee through in the operating room.” (participant-10) This included breaking procedures down into a series of smaller steps. As learners progressed, they took on several steps chunked together and finally brought all the steps together into a whole. The teachers also supported learners by offering tips for completion of complex tasks or by providing on-the-spot support. “Just because a patient is complex doesn’t mean that they won’t be working with a student...because the resident may also be in the room with them, or I may be in the room with them.” (participant-4)

Expectations

The vast majority of clinical teachers used differing expectations of the learners to shape their teaching and the learners’ experiences. For instance, they only expected junior learners to demonstrate basic knowledge, clinical reasoning, and patient care skills; be able to attend to 1-2 patients or issues; and to require close supervision and support. They then raised their expectations for more experienced learners. This included an expectation of graduated

responsibilities and increased autonomy of the learners over time. More senior learners were expected to demonstrate increasing ability to handle higher patient volumes, prioritize tasks and work efficiently, function effectively within clinical teams/systems, inform practice with evidence from the literature, and supervise and teach junior learners.

In terms of the R3, I give them space...I sit quietly and let the R3 [lead multi-disciplinary rounds]...I delegate [assignment of intern tasks] to the R3...Interns who seem to be not performing,...if there are [medical student] progression issues, I usually let the R3 try to tackle it first. (participant-16)

Selection of Learning Activities

In addition to having a specific sense of the order in which learning should occur, the clinical teachers also described how they decided what activities to select for an individual learner. Teachers used a combination of the learner's level of training and associated expected competencies, and information about the learner's actual developmental level to choose learning activities for learners.

In teacher-learner interactions lacking continuity, where the relationship is new or brief, teachers depended almost entirely on the learner's level of training to select learning activities. "I will take into consideration...what their level is...that's a pretty good starting point." (participant-18) They then gathered data from interactions with the learner to determine the learner's individual developmental level and adjust learning activities accordingly. Selection of learning activities became increasingly individualized as the teacher-learner relationships became longitudinal. One clinical teacher described the investment by both the learner and the teacher in longitudinal relationships and how the two form a partnership to push forward on the learner's developmental trajectory together. In order to promote continuity and provide more individualized teaching, some teachers practiced and advocated for forward feeding or handing off learners to the next teacher.

The clinical teacher's choices of learning activities were additionally influenced by the curricular goals/objectives, learner's goals, their own goals for the learner, and developmental considerations. Most teachers solicited learning goals from learners. However, they felt the learners' goals needed to be adjusted based on teacher and curricular goals since learners do not necessarily have a vision of training outcomes nor accurate self-assessment and insight. "We play a role in guiding them...sort of corrections along the path, so that they can get to this goal that I see more clearly than they do." (participant 1) The teachers opted for high yield topics that met the learner's learning gaps and deliberately pushed learners along the developmental trajectory with specific coaching or challenging assignments.

You want to be able to structure learning such that the student can feel that they bring something that they already know, and they can use it...but at the same time, be motivated to build on that skill and to continue to move forward. (participant-19)

Teacher Responsibilities

For almost all clinical teachers, they viewed the promotion of learner development as part of their teaching responsibility and commitment to learners. Some described it as their most important role as a teacher.

I think we're fundamental to [promoting developmental progression of learners]...if we're working with trainees and we're not watching the store when we're with them, then no one's watching the store... (participant-9)

A small minority (those without longitudinal relationships with learners) felt that responsibility for promoting learner development was a separate responsibility from that of teaching. They took responsibility for teaching specific content but not necessarily for monitoring or furthering the development of a learner's knowledge or skill from one teaching encounter to the next. These clinical teachers depended on the curricular program to ensure developmental progression of learners.

I don't per se think that curricular development, promoting the learning of the student, is the responsibility of the standard faculty member. I think that's the responsibility of the educational leaders...They're the ones who should be in some way assessing the development of the students through [standardized] assessments...[I] don't really expect the faculty members...necessarily to have a goal to move the student forward except in... longitudinal experience[s]. (participant-10)

Significantly, the clinical teachers discussed the need to balance their responsibility to learners with their responsibility to patients. They viewed their job as one of ensuring that optimal patient care is delivered while simultaneously teaching. For some it was this responsibility to patients or the public that informed their sense of responsibility to the learner. In these cases, ensuring patient safety was the primary reason to attend to learner development.

DISCUSSION

Our study of excellent clinical teachers revealed a deliberate structuring and sequencing of learning opportunities in the clinical workplace for different level learners. Despite the perceived lack of control over patient cases, these excellent clinical teachers were able to match clinical learning opportunities to individual learner levels and encourage developmental progression. One, they sequenced clinical learning opportunities by varying or managing content, complexity, and expectations. Two, they decided which learning opportunities to select for individual learners based both on expected curricular competencies and their assessment of learners' developmental needs. In essence, they adjusted the difficulty/challenge of a learning opportunity to the learner's appropriate learning level, and defined the appropriate learning level to be the growth edge or next step in the learner's developmental trajectory that aligns with curricular aspirations. Both learner growth as well

as patient safety considerations drove clinical teachers' attention to learner developmental levels and selection of learning activities.

Prior studies on selection of patients for student teaching demonstrated that clinical teachers took into account potential educational value of the interaction (e.g. how well the patient case fit their educational/teaching objectives) and used the potential of psychosocial and communication challenges as exclusion factors.^{26,27} We looked at clinical situations where the teacher is required to care for a panel of patients with a range of different level learners and must balance patient care with their teaching responsibility. Here we found that they similarly considered the educational value of learning activities and were influenced by the presence of psychosocial and communication challenges. However, instead of merely choosing from among available patient cases, the excellent clinical teachers we studied actively structured the available cases and learning opportunities to suit the developmental level of their learners.

The teachers supported individualized learning by applying sequencing principles at the level of individual learner interactions. Previously, the concept of sequencing had only been described at the curricular level.^{2,5} The teachers' strategies of varying content and managing complexity incorporate Collins' three principles for curricular sequencing: increasing complexity, increasing diversity, and conceptualizing whole tasks before breaking the tasks down into smaller steps.² The management of complexity by presenting earlier learners with classic cases and focusing initial content on more generalizable knowledge and skills exemplifies Collins' principle of increasing diversity. It is consistent with clinical teaching models such as the One Minute Preceptor, where one of the steps is to teach a general principle.²⁸ Bordage also recommended that initial teaching should focus on prototypes with limited presentations to provide anchors for future examples that are more complex and diverse in presentation.²⁹

In his work with medical students, Dornan has argued that one of the most important behaviors for clinical teachers to exhibit is the ability to include learners and support their participation in authentic patient care activities.⁵ Our study of excellent clinical teachers corroborates the findings from Dornan's studies on medical student learning^{4,5} and extends them to include resident and fellow learning. The teaching practices described by the excellent clinical teachers in our study can offer potential guidelines for how others may sequence access to workplace activities for their learners. Table 2 is a summary of strategies for sequencing and selecting clinical learning activities to match learning opportunities with learners at different levels and ensure patient safety as well as learner development. These strategies originate from our study results and include the authors' interpretation of the data which was informed by the framework of cognitive apprenticeship. Each strategy includes specific suggestions for practical application, derived from examples provided by clinical teachers in our study.

There are limitations to this study. First, this was a single institution study. While we did only interview clinical teachers from one institution, they exemplified faculty with known

excellence in teaching, worked at three very different medical centers (academic, county, veteran's administration) and reflected a variety of specialties. Second, this was an interview study where clinical teachers provided self-reports of their teaching practices. Their self-reports may not be an accurate reflection of their actual teaching behavior in the clinical environment. This was therefore an initial study to explore approaches to teaching different level learners, and having the clinical teachers articulate their practices and the rationale behind them allowed for better understanding of their approaches. A follow-up observational study is needed to confirm our findings for teacher selection of learning experiences for different level learners. Additionally, we focused only on excellent teachers and future work is needed to address comparisons to other teachers.

As has been noted by Yardley and colleagues, the importance of offering cognitive and practical support to learners is becoming more crucial as early learners spend increasing time in the clinical workplace.³⁰ Excellent clinical teachers described on-the-ground sequencing and activity selection teaching strategies, which they used as an adjunct to curricular sequencing, to choose developmentally appropriate clinical learning experiences for learners at different levels. These strategies may help all clinical teachers to safely ensure engagement of every learner in the clinical workplace and promote learner progression along a developmental trajectory.

Practice Points

1. Excellent clinical teachers deliberately structure and sequence learning opportunities in the clinical workplace for different level learners.
2. Excellent clinical teachers sequence clinical learning opportunities by adjusting case content, managing case complexity, and tailoring expectations for different learners.
3. Excellent clinical teachers strategically select learning activities to promote individual learner progression along a developmental trajectory.
4. Both learner growth and patient safety considerations drive the attention of excellent clinical teachers to learner developmental levels and selection of learning activities.

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Chapter 6

An Interview Study of How Clinical Teachers Develop Skills to Attend to Different Level Learners

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An interview study of how clinical teachers develop skills to attend to different level learners.

ABSTRACT

Purpose

One clinical teaching challenge is the engagement of learners at different levels. Faculty development offerings mostly address general strategies applicable to all learners. This study examined how clinical faculty members develop the skills to work with different level learners.

Methods

We conducted semi-structured interviews with medical school faculty members identified as excellent clinical teachers teaching multiple levels of learners. They discussed how they developed their approach to teaching different level learners and how their teaching evolved over time. We performed thematic analysis of the interview transcripts using open and axial coding.

Results

We interviewed 19 faculty members and identified three themes related to development of teaching practices: teacher agency and work-based learning of teaching strategies, developmental trajectory of clinical teachers, and interplay between clinical confidence and teaching skills. Faculty members were proactive in using on-the-job experiences to develop their teaching practices. Their teaching practices followed a developmental trajectory towards learner-centeredness, and this evolution was associated with the development of clinical skills and confidence.

Conclusions

Learning skills to teach multi-level learners requires workplace learning. Faculty development should include workplace learning opportunities and use a developmental approach that accounts for the trajectory of teaching as well as clinical skills attainment.

INTRODUCTION

One major challenge in teaching is the engagement of learners at different levels of knowledge, skill, and training, either separately or simultaneously.¹⁻⁵ In clinical teaching, teachers are required to both teach to the right developmental level of each learner and enable learner participation in workplace activities appropriate for their stage of learning.^{3,4} This challenge is intrinsic to the clinical environment in which learners of many levels interact with faculty members and staff to provide care to patients. In this setting, faculty members have the responsibility of ensuring that each learner meets expectations necessary to progress. Additionally, with the increasing emphasis on early clinical experiences, faculty members may be teaching learners who are more junior than the learners they previously encountered in the clinical environment.^{6,7} Today's faculty member must meet the challenge of engaging and promoting the developmental progression of a wide range of different-level learners while providing safe and quality patient care.

Excellence in clinical teaching requires knowledge and skill beyond that of one's clinical specialty. Faculty members must be prepared for their teaching role and faculty development programs play a vital part in improving faculty teaching effectiveness.^{3,8-10} The majority of faculty development offerings are designed to improve teaching skills. Studies of excellent clinical teaching have focused primarily on teacher characteristics (e.g. enthusiasm, role model) or general skills (e.g. feedback and communication skills)¹¹⁻¹⁴ and faculty development offerings have followed suit; they mostly focus on general skills and strategies that are to be applied to all learners independent of learner level (e.g. clarifying expectations, checking learners' understanding, or providing feedback).¹⁰ Typical faculty development offerings do not specifically address the challenge of working with different level learners or the teacher's role in choosing developmentally appropriate activities for learning.¹⁰

In addition, the successful development of faculty members may require approaches beyond the simple incorporation of skill-specific teaching sessions/workshops that frequently are the focus of faculty development programs.¹⁰ Effective programs employ diverse methods that include elements of experiential learning, feedback, and collegial relationships.¹⁰ Different authors recommend paying attention to context, workplace community, and the lived experience of faculty members and using that experience to guide faculty development efforts.^{10,15,16}

There is little literature on the skill development of clinical teachers for working with learners at different levels. We recently reported on strategies, such as the sequencing and selection of learning activities, that excellent clinical teachers used to work with groups of and individual learners at different levels.¹⁷ These strategies for engaging and ensuring participation of different level learners and for teaching to individual developmental levels could be incorporated into faculty development offerings to help faculty members navigate this clinical teaching challenge. However, for optimal effectiveness, the design of the faculty development must be informed by the lived experience as well as the workplace context of the teaching faculty.

The purpose of this study was therefore to examine how excellent clinical teachers working in the context of dynamic clinical environments, develop skills to address the specific teaching challenge of working with individual learners as well as groups containing learners of different levels while maintaining safe, quality patient care. This knowledge will help inform how we prepare faculty members for clinical teaching.

METHODS

Design

This study of the development of teaching practices among excellent clinical teachers was part of a larger single institution qualitative interview study on how excellent clinical teachers approach selection of learning experiences for different level learners.¹⁷ We defined clinical teachers as physician faculty members who directly supervised learners in the clinical environment and who jointly cared for patients with the learners. We used a constructivist grounded theory approach to understand and develop a model for how teacher's practices evolved. We assume teachers may conceptualize their skill development in different ways and acknowledge the interpretative nature of our model generation.¹⁸⁻²⁰

Context

The study was conducted at the University of California San Francisco (UCSF) School of Medicine (SOM), and was approved by the UCSF institutional review board. SOM faculty members can apply for membership in the UCSF Academy of Medical Educators (AME). Applications undergo rigorous external review and members are selected based on their teaching excellence as evidenced by learner evaluations and peer reviews, and accomplishments in medical education. AME members represent 4-5% of the SOM faculty and exemplify the best teachers across all UCSF core teaching sites, departments, and clinical and classroom settings.²¹

Participants

To select participants most likely to provide rich information about the development of skills for teaching multiple levels of learners, we used two purposeful sampling methods. First, we used criterion sampling to pick participants who met the following pre-specified selection criteria: 1) membership in the UCSF AME, 2) physicians in clinical practice, and 3) teachers of learners of different levels in the clinical setting. Seventy-seven faculty members met these criteria. Emerging themes from early interviews suggested a potential difference in perspective and lived experience among faculty members in procedural and non-procedural specialties and those working in inpatient and outpatient settings. We therefore used theoretical sampling after the first round of interviews, to further select from among eligible participants, those whom we predicted would add new and varying perspectives on teaching skill development.^{18,20,22} We sent invitations to participate in individual interviews in successive waves and stopped our recruitment when we reached theoretical saturation.

Instrument

We developed a guide for our semi-structured interviews, which was piloted with three non-AME clinical faculty members and refined prior to implementation. We asked the following questions, focusing on the participants lived experience as faculty members:

- 1) How did you develop your current approach to working with learners at different levels (either individually or in a group of multi-level learners)?
- 2) How did you figure out what learning activities or opportunities to give which level of learner?
- 3) How has your teaching changed over time?
- 4) Do you have other comments about your teaching experiences with learners at different levels?

Procedure

Two authors (SF, BK) conducted the semi-structured interviews between January 2012 and March 2013. Each was trained in interview methods and interviewed approximately half of the study participants either in-person or by telephone. They were non-AME junior clinician faculty members who were not well known to the study participants. As such, they were able to function primarily as outsiders with some insider knowledge of the clinical teacher experience. They debriefed their interviews with another author (HCC), who as an AME member meeting study criteria, was positioned as an insider. This insider/outsider approach allowed an understanding and appreciation of the complexity and patterns present in the data without undue influence on the data collection. The interviews averaged 30 minutes in length (range 15 to 50 minutes) and were audio-recorded. The audio files were transcribed verbatim and de-identified.

Data Analysis

We performed inductive thematic analysis of our data using an iterative process during and after data collection. In inductive thematic analysis, themes emerge naturally from the data rather than being imposed.²³ Three clinician educator authors (HCC, SF, BK) first familiarized ourselves with the transcripts and then performed initial open coding of the same six randomly selected transcripts to identify codes. We compared our coding lists and reconciled differences before developing a codebook for thematic analysis. Two authors, one positioned as an insider and the other an outsider (either HCC/SF or HCC/BK), independently applied the codebook to all transcripts for open and axial coding,^{18,24} and met to discuss and reconcile any coding discrepancies.

One author (HCC), who had insider knowledge of participant clinical teaching and faculty development experiences, took the lead in further abstracting, organizing and synthesizing the themes. Initial data analysis was conducted without the use of sensitizing concepts. However, the organization and reporting of final themes were influenced by the theoretical perspectives of workplace learning²⁵ and cognitive load²⁶. To maintain reflexivity, these final phases of analyses involved discussions with the larger study team, consisting of three non-

clinicians (AT, OtC, PO'S).¹⁸ They functioned primarily as outsiders, though PO'S had expertise in faculty development, to provide additional perspectives and challenge assumptions.

We used Dedoose Version 4.12.4 (<http://www.dedoose.com>) for our data organization and analyses. We looked at frequency of codes, co-occurrence of codes, and stratification of codes by years of teaching experience as part of our analyses. We reached saturation within our sample. We did not discover new codes or themes despite additional sampling and the amount of data we gathered was sufficient to inform our understanding of and conceptual model for the development of teaching skills.^{20,27}

RESULTS

Of the 46 faculty members invited, 20 responded and 19 agreed to participate. The participants averaged 18 years (range 6 to 33 years) of teaching experience. All taught both medical students and residents, and more than a third of them also taught fellows. They were 58% (11) men and from 10 specialties with 74% (14) from non-procedural specialties. They taught in diverse clinical settings (clinic, emergency room, ward, nursery, nursing home, intensive care unit, operating room) and at three different sites (public, tertiary care, and veteran's hospital).

Three themes were identified related to the development of teaching skills among excellent clinical teachers: 1) teacher agency and work-based learning of teaching strategies, 2) developmental trajectory of clinical teachers, and 3) interplay between clinical confidence and teaching skills.

Teacher Agency and Work-Based Learning of Teaching Strategies

Faculty members positioned themselves as learners in regards to their teaching skills and demonstrated a high degree of learner agency in transforming their workplace experiences into personal development opportunities. While many of the clinical teachers had participated in formal faculty development offerings, most of them actively used on-the-job experience and trial and error to inform their approach to teaching learners at different levels. For instance, they described using course objectives, curriculum committee meetings, evaluation sessions, and academic standards meetings to educate themselves on the expected developmental progression of learners and to develop benchmarks for use in their teaching.

“The evaluation sessions we have in [the longitudinal integrated clerkship] are helpful...The main purpose of those meetings is to bring preceptors together to discuss how a [learner] is doing and be able to synthesize feedback for the [learner]. But I think that is an example of a method that provides faculty development because faculty are talking together about where the [learner] is now and what the next step would be for them to develop.” (participant-5)

One faculty member described utilizing teaching experiences with large groups of same level learners to learn about the range/variation in skill within learners at a given level. Another used teaching with groups of different-level learners to solidify his understanding of differences among learners at different levels.

“So if a topic comes up...and you’re surrounded by the whole spectrum of learners, you start getting good by asking questions that go up the chain of command to see when different levels of [learners] tend to be stuck, how you find the margin of their knowledge. And also, you start to get a sense of what techniques work for an intern, compared to a student, compared to a resident.” (participant-3)

In addition to taking advantage of workplace experiences to learn about learners at different levels, the faculty members looked to their education, departmental, and professional communities to develop and improve their teaching skills. They sought out mentors, learned from the example of others, and compared notes and shared best practices with colleagues.

“When we precept, we often precept in a room with multiple learners and preceptors at the same time just because of a space shortage...You’ll hear other people – sometimes more experienced people...precepting other learners. I think that’s actually the best source of education of all...” (participant-11)

Faculty members with the greatest years of teaching experience talked considerably more than others about the informal development of their teaching skills via workplace experiences.

Developmental Trajectory of Clinical Teachers

All of the faculty members reported a developmental progression in their clinical teaching. They moved from being more teacher-centered and dogmatic in style to being more learner-centered and flexible in style, and this affected their ability to attend to different level learners. The faculty members initially assumed the role of experts who conveyed teacher-determined content/knowledge to passive learners. “Before, I would...be a little encyclopedia and just rattle off things I hoped the student would absorb.” (participant-17) Over time, the faculty members assumed the role of facilitator and collaborator, letting individual learner goals and needs guide their teaching. As they became more learner-centered, they also gave greater consideration to the learning process including the learning environment and whether a learner was just listening or demonstrating deeper learning.

“When I first started teaching, it was inevitable...to focus on the content...the actual information I passed on. Now...it’s my process of teaching that I focus on – will this session be interactive...will the environment be good if I set it up this way – so I think more about my teaching process now than I do about content.” (participant-3)

Despite their distinction as excellent clinical teachers, several of the faculty members pointed out the need for ongoing personal development, particularly for specific skills such as helping learners progress along a developmental trajectory. They recommended the development of teaching scripts similar to the illness scripts they use in clinical care. For instance, some participants suggested that faculty members be formally educated on what a prototypical learner looks like at various stages, expected learner trajectories with clear benchmarks, and strategies for pushing learners to the next level.

“It’s almost like we need to see a video of an average beginning third-year medical student’s medical knowledge or an average mid-third-year medical student communication skills...in very much the same way I was talking about earlier about showing early learners what a patient with a CHF exacerbation looks like.”
(participant-2)

One participant suggested that there should be a similar developmental trajectory with benchmarks for clinical teachers and that faculty members could be evaluated and given feedback and guidance based on their progression on their teaching skills trajectory.

Interplay Between Clinical Confidence and Teaching Skills

Faculty members described the evolution of their teaching abilities and teaching confidence in association with their increased clinical experience and clinical confidence. As clinical work and teaching became routine, faculty members were able to better attend to individual and different level learner needs and subsequently, strategies for meeting their needs. Their increased clinical confidence translated into increased learner-centeredness. The faculty members became willing to be flexible, to allow learners to drive the teaching interaction, and to accommodate individual learner needs. As belief in their own ability to effectively guide different level learners in providing safe and appropriate care increased, they could allow themselves to place more trust in their learners’ abilities.

“[I was] very anxious about things that could go wrong...one of the transformative things is that [surgeries] became...so routine that the anxiety component was removed...I kind of had been through almost every complication that could occur and I kind of knew what to do...that’s helped me to be calmer and to tolerate more sluggish progress on the part of the [learner] because I know that I can get them out of this, and as long as they’re not doing anything dangerous, I can roll with it a little bit.” (participant-12)

DISCUSSION

Our study of faculty members who were excellent clinical teachers revealed that their strategies for teaching different learner levels developed with experience and via trial and error. These teachers were agentic or proactive learners who used their workplace experiences to develop their teaching skills. The development of their teaching practices

appeared to follow a trajectory; the ability to be learner-centered and focused on needs of different level learners developed progressively over time. This evolution of teaching skill and confidence in working with different level learners appear closely associated with the development of clinical skills and clinical confidence.

We have evolved an understanding of the developmental trajectory of teaching different level learners and a potential theory for the development of excellent clinical teachers. The interrelationship of the themes suggests that committed early clinical teachers start by honing clinical skills while applying basic teaching skills. They use their workplace experiences to build upon these initial skills, learning through guidance from the curriculum, locally available advice, and trial and error. With clinical experience over time, they shift to focusing on learners rather than clinical skills and become ready for development of additional, more specific teaching skills.

While educators use the framework of workplace learning to understand the learning of health professions learners in the clinical environment, they have not framed faculty development through this lens, even though learning through experience can play a role.²⁸ Our findings on the development of skills for working with different level learners suggest that workplace or on-the-job learning is very much a key element in the development of clinical teachers, particularly for specific skills that may not be addressed in faculty development offerings. The faculty members in our study were agentic learners in that they were motivated, proactive, self-directed, and highly engaged in teaching-related work-based activities.²⁵ They transformed their educational responsibilities and work on committees into learning opportunities. They took advantage of workplace artifacts such as teaching evaluations and curricular materials to improve their teaching. They also sought guidance from colleagues in the workplace and participated in available faculty development opportunities. The self-improvement steps faculty members took are consistent with the themes Steiner outlined for the developmental process of medical educators,¹⁶ suggesting that we should encourage personal agency and build support directly into the workplace for the development of clinical teachers.

The faculty members in our study described a developmental progression in their teaching over time. They initially focused on knowledge of their subject matter and as they became more comfortable over time, paid increasing attention to the learning context and the learners, allowing them to attend to the specific needs of different level learners. These faculty members had previously described sequencing clinical learning opportunities when working with different level learners in order to match learning activities to a learner's location along a developmental trajectory¹⁷. They now suggested that faculty members similarly should have, for their own growth as clinical teachers, a teaching skills trajectory with developmental benchmarks. Different authors and organizations have published core teaching competencies for medical educators in relationship to different educator roles, including that of the clinical teacher.^{9,29-31} These core competencies could be used in the deliberate planning of faculty development with sensitivity to what can be fostered in the workplace.

However, the developmental trajectory of clinical teaching skills may not be a simple one and likely overlaps with the progression of faculty clinical skills and confidence. The change in teaching focus described by the faculty members, from teacher-driven knowledge-based content to attending to the learning process is consistent with reports across different educational settings.^{32,33} In a study of peer observations of clinical teaching, new teachers tended to focus on facts and knowledge while more experienced teachers focused on the learner's thinking process.³⁴ Unlike these previous studies which link teaching practices to teaching experience, our results indicate that clinical experience also impacts teaching practice. Our faculty members related the evolution of their teaching to not just the routinization of their teaching, but the routinization of patient care activities and increased confidence in their ability to guide different level learners in providing safe patient care. One explanation for this co-evolution is cognitive load theory.²⁶ Cognitive load theory maintains that working memory can only process a limited amount of information. A junior clinical faculty member for whom patient care and teaching activities have not yet been routinized, must expend more cognitive effort on those activities, and subsequently have less cognitive capacity to attend to varying learner needs and different teaching strategies. They may be less able to develop their pedagogical content knowledge, which for a clinical teacher includes knowledge of the medical content/patients, clinical and teaching context, learners, and general principles of teaching/learning.^{35,36} Irby has suggested that this pedagogical content knowledge could be integrated into teaching scripts³⁶, which were requested by some faculty members and may help further decrease cognitive load.

We acknowledge the limitations inherent to a single institution study. While we only interviewed clinical faculty members from one institution, they exemplified faculty members with experience and known excellence in teaching, worked at three different medical centers, and reflected a variety of procedural and non-procedural specialties. In addition, this was an interview study where faculty members provided self-reports of the development of their teaching practices. These self-reports may not be accurate reflections of their actual developmental trajectory as teachers and the exact relationship between teaching and clinical skills development requires further exploration. However, our findings were consistent with a prior observational study.³⁴ We asked how participants developed skills for addressing a specific teaching challenge, teaching learners at different levels. It is possible that our findings may not be generalizable to how faculty members develop other teaching skills. Lastly, all participants were proactive teachers who identified themselves as educators. They attended to the development of their teaching skills with deliberate practice and sought out faculty development opportunities. Not all faculty members fall into this category. Future studies might explore how typical faculty members, who are not necessarily excellent clinical teachers, develop skills to manage more general or additional teaching challenges.

Though focused on development of a specific teaching skill, the findings of this study may have several implications for faculty development. While it remains unclear what the ideal balance between formal faculty development and informal workplace learning might be, we could begin adding workplace-based development to faculty development programs. For instance, teachers can be given tips on what to notice in their teaching activities and work

responsibilities that could help inform their teaching. Workplaces could create communities of practice with opportunities for side-by-side teaching, observation, role modeling, and peer learning and sharing of best practices. In addition, we should consider developmental trajectories for faculty teaching skills. We could develop benchmarks for different teaching competencies, each with a hierarchical sequence of skill development. Lastly, we need to take into account the issue of cognitive load and the impact of clinical skills development and clinical confidence on the developmental progression of teaching skills. Even in agentic teachers striving for excellence, there may be a limit to how much they can learn and apply new or more learner-centered teaching strategies until their clinical work is routinized.

In summary, this study revealed three themes about how faculty members develop the skills to overcome a teaching challenge not typically addressed in available faculty development offerings. We advocate for workplace learning opportunities and formal faculty development offerings for clinical teachers that focus increasingly on their developmental trajectory as clinical educators while taking into account their development as clinicians.

Practice Points

1. Faculty members develop strategies to teach different level learners through on-the-job experience and trial and error.
2. Excellent clinical teachers transform their work responsibilities into learning opportunities to improve their teaching.
3. Faculty teaching practices follow a developmental trajectory toward learner-centeredness as clinical and teaching confidence increase.
4. Faculty development should include workplace learning opportunities and account for the trajectories of teaching and clinical skills development.

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Chapter 7

Student Goal Orientation, Perceptions of Early Clinical Experiences and Learning Outcomes

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ABSTRACT

Background

Workplace learning is optimized when learners engage in activities of the workplace; learner engagement is influenced by workplace affordances and learner agency. Learner agency can be operationalized through achievement goal theory, which explains that students can have different goal orientations as they enter learning situations: *mastery* (learn/improve), *performance-approach* (demonstrate competence) or *performance-avoid* (avoid demonstrating incompetence). Mastery-oriented, compared to performance-oriented, students approach curricular experiences as opportunities for developing rather than demonstrating competence. This study explored the relationships among students' achievement goal orientations, workplace affordances, and learning outcomes in the context of early clinical experiences.

Methods

Students who completed their pre-clerkship curricula at four medical schools answered a questionnaire about their personal goal orientation and the perceived goal structure and workplace affordances of their preceptorship experiences. All items used a 5-point scale (1=strongly disagree/not at all true, 5=strongly agree/very true). Students were evaluated by their preceptors and completed standardized-patient exams at the end of their pre-clerkship curricula. Analyses included descriptive statistics and mediation analysis.

Results

Of 517 students, 296 (57.3%) responded and 253 (85.5%) had linked performance data. Student goal orientation means were: *mastery* mean=4.27 (SD=0.65); *performance-approach* 2.41 (0.76); *performance-avoid* 2.84 (0.88). Student goal orientation and performance on preceptor evaluations (*PEval*) or standardized-patient exams (*SPEXam*) were not significantly related. Perceptions of a mastery-structured curriculum and inviting workplace were associated with higher *SPEXam* ($\beta=0.28$, $p=0.02$) and *PEval* ($\beta=0.51$, $p=0.00$) scores respectively. Student mastery goal orientation was positively associated with perceptions of a mastery-structured curriculum ($\beta=0.59$, $p=0.00$) and positive workplace affordances ($\beta=0.25-0.29$, $p\leq 0.01$).

Conclusions

Students held a predominant mastery goal orientation towards their early clinical experiences. Mastery-oriented students perceived preceptorships as mastery-structured with positive workplace affordances, and those perceiving a mastery-structured or inviting preceptorship performed better. Clinical experiences should be structured to emphasize learning rather than demonstration of skills to promote learning outcomes.

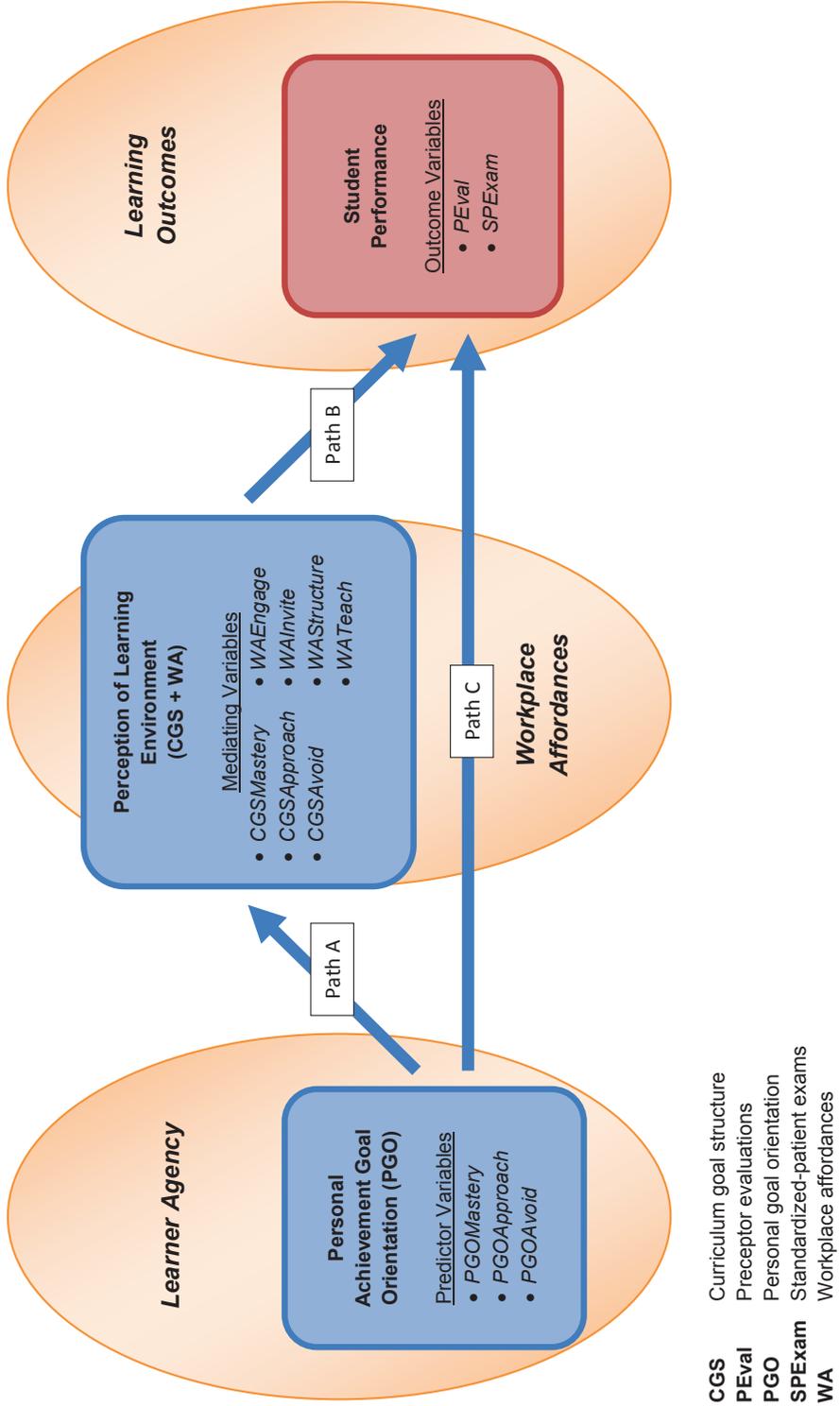
INTRODUCTION

Cooke and colleagues argue that integration of didactic knowledge and experiential learning should occur from the very beginning of medical education. Clinical experiences should drive the learning of all content domains and the content to be learned should be situated in the context of patient care.¹ Medical education scholars and regulatory and professional bodies have advocated for early clinical experiences, and medical schools increasingly offer early clinical workplace placements or preceptorships with interactions with real patients.¹⁻³ Though pre-clerkship students have shown themselves to be capable of contributing to activities of the clinical workplace, many early clinical experiences consist of shadowing rather than participatory experiences.⁴⁻⁸ In the workplace learning literature, learning occurs through participation in work. To achieve optimal learning in their early or later clinical experiences, learners need to actively engage in, not just observe, the tasks of the clinical workplace.^{9,10}

Billett maintains that learner engagement in the workplace is influenced by two factors.^{9,11} The first factor is the *affordances* or the engagement opportunities and invitational qualities of the workplace. For instance, faculty can help afford opportunities for participation by creating workplace tasks that allow learners to engage at the highest level allowed by their abilities.¹²⁻¹⁴ Second is learner *agency* or the intentionalities as well as actions that mediate and shape learner participation.⁹ Individual learners determine whether and how they participate and what they learn. A learner who is reluctant to engage or puts little effort into participating may not learn.¹¹ Learner agency can also determine how learners perceive and judge the affordances or learning environment of the workplace, further influencing their decisions to engage.⁹ Figure 1 depicts the relationship between learner agency, workplace affordances, and learning outcomes. Therefore, attending to the development of learner agency as well as workplace affordances in curricular design may help students more effectively engage in and learn from their early clinical experiences.

One way to conceptualize learner *agency* is with achievement goal theory (AGT). Based in social-cognitive roots and often used to look at academic achievement, AGT addresses both motivation and behavior. It integrates how learners think of themselves, their tasks, and their performance with the learners' purpose or reason for their behavior, and provides a framework for understanding how learners approach and engage in learning opportunities.¹⁵ According to AGT, individuals encountering learning situations can have three different goal orientations: mastery, performance-approach, and performance-avoid. In mastery goal orientation, the learner's goal is to learn or improve and the learner defines success in relation to the task. This goal orientation is associated with adaptive patterns of learning. Learners with performance-approach goal orientation seek to demonstrate ability or appear competent by outperforming others. In performance-avoid goal orientation, learners strive to avoid failure or appearing incompetent. Learners with the latter two performance related goals define success in relation to others rather than to the task or self; these learner orientations are associated with less adaptive patterns of learning.¹⁶ For instance, a mastery goal oriented student may exhibit agentic behavior by enthusiastically volunteering to participate in

Figure 1: Conceptualization of Learner Agency as Achievement Goal Orientation, and its Relationship to Workplace Affordances or the Learning Environment, and Learning / Performance Outcomes



challenging activities because of his/her focus on learning new skills rather than avoiding the risk of failure. This behavior may lead to robust learning experiences and positive learning outcomes. In contrast, a performance-avoid oriented student in a similar situation may appear less agentic due to his/her reluctance to participate for fear of looking incompetent. This lack of participation may result in decreased learning and lower performance on outcomes assessments.

Although learners' achievement goal orientations have been shown to be associated with learner behaviors and related to achievement and academic outcomes,¹⁶⁻¹⁸ few studies have used achievement goal orientation to examine learning in the workplace.^{17,19} We will explore the relationships among students' agency or achievement goal orientations towards their pre-clerkship clinical experiences, the workplace affordances of their clinical preceptorships, and their learning outcomes. See Figure 1. Our hypothesis is that students who have mastery goal orientations will demonstrate better performance in clinical skills assessments, mediated by the affordances in the clinical learning environment.

Information from this study will help inform strategies for improving early clinical workplace experiences, including how to help students maximize their learning in pre-clerkship preceptorships and develop positive habits for their continued clinical training.

METHODS

Design and Settings

This multi-institutional prospective, correlational study was conducted and approved by the institutional review boards at Stanford University, University of California Davis, University of California San Francisco, and University of Southern California. All these schools provide early clinical experiences in their pre-clerkship clinical skills curricula through preceptorship placements in inpatient or outpatient settings. Study participants were students who had recently completed their second year of medical school and entered clerkships, when they could recall their attitudes and behaviors towards their pre-clerkship preceptorships and had end of second year clinical assessment data.

Procedures

Between late April and early October of 2013, all students who had completed their pre-clerkship curricula and entered clerkships were invited to answer either a paper or online confidential questionnaire about their pre-clerkship preceptorship experiences. Data from the questionnaire were confidentially linked to pre-clerkship preceptor ratings of student performance and student scores on a final pre-clerkship standardized-patient exam.

Measures

Learner Agency (predictor variables): The Patterns of Adaptive Learning Scale (PALS) is a measure with evidence of validity.^{20,21} PALS measures student personal goal orientation

(PGO).^{20,21} Table 1 summarizes the PALS subscales of *PGOMastery*, *PGOApproach*, and *PGOAvoid*. We made minor wording changes to adapt the scales for a clinical learning environment. For instance, the item “it’s important to me that I don’t look stupid in class” was changed to “it’s important to me that I don’t look stupid during preceptorship”. All items used a 5-point Likert scale (1 = not at all true, 5 = very true). We created scores for each subscale by generating an average score for items within the subscale.

Workplace Affordances (mediating variables): We used student perceptions of the learning environment as the best proxies for workplace affordances, which are difficult to measure directly. We divided learning environment into two components, curriculum goal structure and workplace affordances. Perceived curriculum goal structure (CGS) was measured using PALS subscales of *CGSMastery*, *CGSApproach*, and *CGSAvoid*. The questionnaire also included locally developed items to capture student perceptions of workplace affordances (WA) present in their preceptorship workplace. These items made up four subscales, *WEngage*, *WInvite*, *WStructure*, and *WATeach*, summarized in Table 1. All CGS and WA items used a 5-point Likert scale (1 = not at all true/strongly disagree, 5 = very true/strongly agree) and we averaged scores across items within each subscale to generate subscale scores.

Table 1: Questionnaire Subscale Items and Chronbach’s Alphas

Subscale	Cronbach’s Alpha	Question
PGOMastery	0.87	It was important to me that I learned a lot of new concepts that year
		One of my goals in preceptorship was to learn as much as I could
		One of my goals was to master a lot of new skills that year
		It was important to me that I thoroughly understood my clinical work
		I was important to me that I improved my skills that year
PGOApproach	0.81	It was important to me that other students thought I was good at my clinical work
		One of my goals was to show others that I was good at my clinical work
		One of my goals was to show others that clinical work was easy for me
		One of my goals was to look smart in comparison to other students
		It was important to me that I looked smart compared to other students in preceptorship
PGOAvoid	0.79	It was important to me that I didn’t look stupid during preceptorship
		One of my goals was to keep others from thinking I was not smart in preceptorship
		It was important to me that my preceptor didn’t think that I knew less than other students
		One of my goals in preceptorship was to avoid looking like I had trouble doing clinical work

Subscale	Cronbach's Alpha	Question
CGSMastery	0.80	In preceptorship, trying hard was very important
		In preceptorship, how much you improved was really important
		In preceptorship, really understanding the material was the main goal
		In preceptorship, it was important to understand the clinical content/work, not just memorize it
		In preceptorship, learning new ideas and concepts was very important
		In preceptorship, it was OK to make mistakes as long as you were learning
CGSApproach	0.75	In preceptorship, getting good evaluations was the main goal
		In preceptorship, getting right answers was very important
		In preceptorship, it was important to get high evaluation scores
CGSAvoid	0.89	In preceptorship, showing others that you were not bad at clinical work was really important
		In preceptorship, it was important that you didn't make mistakes in front of everyone
		In preceptorship, it was important not to do worse than other students
		In preceptorship, it was important not to look dumb
WAEngage	0.79	I was able to practice interacting with patients
		I was able to practice taking a history
		I was able to practice performing PE maneuvers
		I was able to practice writing notes
		I was able to practice providing information to patients
WAINvite	0.80	My preceptor and I had a positive working relationship
		My preceptor encouraged me to ask questions
		My preceptor encouraged me to ask for or share ideas for new learning opportunities
		My preceptor demonstrated positive thoughts/feelings about me as a student
WAStructure	0.72	My preceptor scheduled patients to come in just for me to see
		My preceptor came in just to teach me on days when s/he had no other patient responsibilities
		My preceptor arranged a lighter patient schedule for the half-day that I was there
WATeach	0.81	My preceptor discussed with me my reasoning for my history or PE
		My preceptor had me document patient encounters by writing notes
		My preceptor provided specific feedback on my clinical skills
		My preceptor debriefed my experiences and reviewed key learning points with me
		My preceptor provided or pointed out learning materials

Learning Outcomes (outcome variables): At the completion of their preceptorship experiences, students were rated on their performance. One school provided an overall evaluation of student performance in the clinical skills course. Three schools specifically evaluated student performance in the preceptorships; they ranged in the number of evaluation instances (1 to 3), the number of evaluation items (6 to 11), and type of scale (3- to 9-point). Preceptor evaluation scores were averaged across all items and from all evaluation instances to generate one score for each student. We then calculated z-scores using the preceptor evaluation scores for all students from within the same institution, including survey non-responders. This score was labeled *PEval*. In addition, at the end of the pre-clerkship curriculum, students took a summative institution-specific standardized-patient exam to demonstrate competence in clinical skills. The number of exam stations varied from 2 to 6 and the number of categories and items scored for each station varied across schools. Each school generated a final total score for each student based on the number or percent of total possible points achieved. This total score was converted into a z-score for each student using the scores of all students who took the exam within the same institution. This score was labeled *SPExam*.

Data Analysis

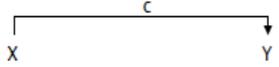
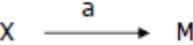
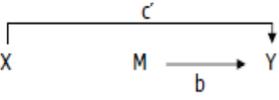
Descriptive statistics were calculated for all participants on questionnaire responses and the two outcome variables. We calculated descriptive statistics for the total sample and computed means for each subscale. We then conducted a one-way ANOVA and post hoc Tukey test to compare the subscale means of the four institutions.

Factor Analysis: We assessed the validity of our internally developed workplace affordances survey items by first conducting an exploratory factor analysis. The data was extracted using principal axis factoring with varimax rotation to determine the underlying latent constructs within the 17 items capturing student perceptions of workplace affordances. Factors were retained based on Eigenvalues greater than 1. Items were assigned to factors based on their largest loading; simple structure was obtained using factor loadings greater than 0.35 for this assignment. We then calculated the Cronbach α coefficient for each factor to determine its scale reliability and computed mean scores for the items associated with each factor.

Mediation Analysis: Mediation analysis was conducted as described by MacKinnon²² and Sobel²³. Mediation analysis is accomplished in 3 steps: 1) testing the direct relationship between the predictor variables (e.g. *PGOMastery*, *PGOApproach*, *PGOAvoid*) on the outcome (e.g. *PEval*, *SPExam*) (Path C); 2) testing the effect of the predictor variables on the mediating variables (e.g. *CGSMastery*, *CGSApproach*, *CGSAvoid*, *WAEngage*, *WAINvite*, *WAStructure*, *WATeach*) (Path A); and then 3) relating the mediating variable to the outcome after controlling for the predictor variable (Path B). See Figure 1 and Table 2. The purpose of steps 1 and 2 is to establish that zero-order relationships among the variables exist. If these relationships are non-significant, we would conclude that mediation is not likely. The conditions of mediation are supported if the effect of the mediating variable (M) (Path B)

remains significant after including the effect of the predictor variable (x) on the outcome (y) (Path C). See Table 2.

Table 2: Details of Mediation Analysis

	Analysis Steps	Visual Display
Step 1	Conduct a simple regression analysis with X predicting Y to test for path c alone, $Y = B_0 + B_1 X + e$	
Step 2	Conduct a simple regression analysis with X predicting M to test for path a, $M = B_0 + B_1 X + e$	
Step 3	Conduct a multiple regression analysis with X and M predicting Y, $Y = B_0 + B_1 X + B_2 M + e$	

RESULTS

Of the 517 students invited to participate, 296 (57.3%) took the survey. See Table 3 for response rates by school. We were able to link student survey and performance data for 253 (85.5%) students.

Results from our exploratory factor analysis supported the survey's 4-factor structure for questions related to workplace affordances. See Table 1 for the Cronbach alpha coefficients calculated for each workplace affordance and PALS (personal goal orientation and curricular goal structure) subscale. Cronbach alpha coefficients ranged between 0.72 and 0.89, which are within the preferred range of internal consistency reliabilities.²⁴

Table 3 lists the means and standard deviations of the each subscale across all institutions, including the three predictor variables or personal goal orientation subscales and the seven mediating variables – three for curriculum goal structures and four for workplace affordances. The overall scores for student personal goal orientation were as follows: *PGOMastery* mean = 4.27 (SD = 0.65); *PGOApproach* mean = 2.41 (SD = 0.76); and *PGOAvoid* mean = 2.84 (SD = 0.88). We compared subscale means, ranges, and reliabilities with the published statistics for the PALS subscales. The only difference was in the scale mean for student perception of a performance-approach curriculum structure (sample mean 2.54 versus published mean of 3.34).²¹ We also compared questionnaire results across the four schools. Though there were statistically significant differences in mean scores between schools, the pattern of the scores (i.e. relative scores among subscales within each school) were similar across schools. See Table 3. There were no statistically significant differences across schools on the two performance outcome variables (*PEval*, *SPEexam*).

Table 3: Descriptive Statistics – Subscale Scores by School

	School A Mean (SD)	School B Mean (SD)	School C Mean (SD)	School D Mean (SD)	ALL Schools Mean (SD) N = 296
Response Rate	100%	68.2%	62.3%	28.0%	57.3%
Personal Goal Orientation					
Mastery (PGOMastery)	4.46 ^a (0.59)	4.28 (0.61)	4.08 ^a (0.67)	4.49 ^a (0.59)	4.27 (0.65)
Performance-Approach (PGOApproach)	2.62 ^b (0.62)	2.64 ^b (0.81)	2.19 ^b (0.70)	2.42 (0.82)	2.41 (0.76)
Performance-Avoid (PGOAvoid)	3.01 (0.74)	3.10 (0.86)	2.65 ^c (0.87)	2.78 (0.95)	2.84 (0.88)
Curriculum Goal Structure					
Mastery (CGSMastery)	4.25 (0.62)	4.17 (0.63)	4.00 (0.55)	4.23 (0.77)	4.13 (0.63)
Performance-Approach (CGSApproach)	2.50 (0.71)	2.63 ^d (0.85)	2.24 ^d (0.76)	3.07 ^d (0.85)	2.54 (0.84)
Performance-Avoid (PGOAvoid)	2.68 (0.82)	2.60 (0.91)	2.12 ^b (0.79)	2.44 (0.98)	2.39 (0.89)
Workplace Affordances					
Engaged learners (WAEEngage)	4.04 ^e (0.54)	4.11 (0.66)	3.67 ^e (0.76)	4.41 ^e (0.53)	3.99 (0.69)
Inviting to learners (WAIInvite)	4.26 (0.55)	4.19 (0.67)	4.17 ^f (0.60)	4.50 ^f (0.73)	4.25 (0.63)
Structured for learners (WAStructure)	2.97 ^g (0.67)	2.54 ^g (1.09)	2.36 ^g (1.05)	2.94 ^g (1.06)	2.67 (1.00)
Teaching to learners (WATeach)	4.15 (0.60)	3.95 (0.72)	3.44 ^h (0.80)	4.22 (0.77)	3.87 (0.79)

^a School C's score lower than Schools A and D, $p < 0.01$

^b School C's score lower than Schools A and B, $p < 0.01$

^c School C's score lower than School B, $p < 0.01$

^d School D's score higher than all other schools, and School C's score lower than School B, $p < 0.05$

^e School C's score lower than all other schools, and Schools A's score is lower than School D, $p < 0.01$

^f School C's score lower than School D, $p < 0.05$

^g School C's score lower than Schools A and D, and School B's score is lower than School A, $p < 0.05$

^h School C's score lower than all other schools, $p < 0.01$

Mediation Analysis Results

Path C: We found no significant relationship between our predictor variables of student personal goal orientation (*PGOMastery*, *PGOApproach*, *PGOAvoid*) scores and our outcome variables of student preceptor evaluation (*PEval*) and standardized-patient exam (*SPEXam*) scores, indicating lack of mediation model. Although we did not observe a direct effect of our predictor variables on our outcome variables, we examined alternate paths using regression analysis.

Path B: In regression analysis using *SPEXam* and *PEval* as the outcome variables, student perception of a mastery curriculum goal structure (*CGSMastery*) was associated with their standardized-patient exam (*SPEXam*) scores, and student perception of an inviting clinical workplace (*WALinvite*) was associated with their preceptor evaluation (*PEval*) scores. See Table 4.

Path A: In the analysis using three curriculum goal structures (*CGSMastery*, *CGSApproach*, *CGSAvoid*) and four workplace affordances subscales (*WAEngage*, *WALinvite*, *WAStructure*, *WATeach*) as outcome variables, student mastery goal orientation (*PGOMastery*) was positively associated with perceptions of a mastery curricular goal structure (*CGSMastery*) and positive perceptions of all four workplace affordance categories. See Table 4.

DISCUSSION

We found that early medical students are predominantly mastery goal oriented towards their pre-clerkship clinical experiences. Student goal orientation is associated with student perception of the curriculum and the workplace affordances present in their clinical experiences. Student perceptions of the curricular goal structures and workplace affordances were in turn related to student learning outcomes. However, there was no direct relationship between student goal orientations and their performance on clinical skills assessments.

The relationship of student perception of their learning environment to their performance outcomes is consistent with what we know about workplace learning. Billett contends that the affordances of the workplace impact student participation and therefore learning.^{9,11} We found that positive student perceptions of the invitational qualities of the workplace were associated with higher scores on preceptor evaluations of student clinical skills performance. The workplace was considered inviting if students perceived that their preceptor encouraged them to ask questions, ask for or share ideas for learning opportunities, and demonstrated positive thoughts/feelings about them as students. We also found that perceptions of a mastery curricular goal structure were related to higher scores on the standardized-patient exam. This is in contrast to the findings by Artino and colleagues which showed a correlation between perceptions of a performance-approach, not mastery, goal structure, with cumulative medical school grade point average.¹⁷ The students in their study perceived their curriculum to be more performance-approach in structure (mean score 3.32) compared with students in our study (2.54). This is likely due to the use of pass/fail only grades in the

Table 4: Mediation analysis with testing of Path C, Path B, and Path A

Analysis	Outcome Variable	Predictor Variable	Univariable Beta Coefficients (p-value)	Multivariable Beta Coefficients (p-value)
Path C	PEval	PGOMastery	0.12 (0.28)	
		PGOApproach	-0.06 (0.54)	
		PGOAvoid	-0.09 (0.26)	
	SPEXam	PGOMastery	0.16 (0.10)	
		PGOApproach	-0.15 (0.07)	
		PGOAvoid	-0.08 (0.28)	
Path B	PEval	CGSMastery	0.27 (0.02)	0.21 (0.09)
		CGSApproach	0.01 (0.92)	0.01 (0.94)
		CGSAvoid	-0.10 (0.20)	-0.10 (0.29)
		WAEngage	0.11 (0.23)	-0.14 (0.27)
		WAINvite	0.49 (0.00)	0.51 (0.00)
		WAStructure	0.09 (0.14)	-0.05 (0.53)
		WATeach	0.20 (0.01)	0.11 (0.31)
	SPEXam	CGSMastery	0.22 (0.04)	0.28 (0.02)
		CGSApproach	-0.11 (0.14)	-0.12 (0.21)
		CGSAvoid	-0.13 (0.09)	-0.06 (0.54)
		WAEngage	0.04 (0.62)	-0.12 (0.31)
		WAINvite	0.22 (0.03)	0.24 (0.06)
		WAStructure	0.03 (0.57)	-0.02 (0.80)
		WATeach	0.06 (0.46)	0.04 (0.72)
Path A	CGSMastery	PGOMastery		0.59 (0.00)
		PGOApproach		-0.05 (0.42)
		PGOAvoid		0.01 (0.90)
	CGSApproach	PGOMastery		0.08 (0.29)
		PGOApproach		0.43 (0.00)
		PGOAvoid		0.10 (0.22)
	CGSAvoid	PGOMastery		-0.03 (0.55)
		PGOApproach		0.31 (0.00)
		PGOAvoid		0.58 (0.00)
	WAEngage	PGOMastery		0.27 (0.00)
		PGOApproach		0.04 (0.61)
		PGOAvoid		-0.10 (0.23)
	WAINvite	PGOMastery		0.25 (0.00)
		PGOApproach		0.05 (0.54)
		PGOAvoid		-0.11 (0.11)
	WAStructure	PGOMastery		0.25 (0.01)
		PGOApproach		0.01 (0.91)
		PGOAvoid		-0.02 (0.86)
	WATeach	PGOMastery		0.29 (0.00)
		PGOApproach		0.08 (0.40)
		PGOAvoid		-0.07 (0.42)

clinical skills courses in our study. It is possible that if the students had been graded with letter or honors/pass/fail grades, we might have seen a higher performance-approach goal structure mean and a greater impact of that on student performance.

Our results confirm the presence of a relationship between student goal orientation and their perceptions of clinical workplace affordances. Students with mastery goal orientations perceived the curriculum to have a mastery goal structure and the clinical workplace as having more positive affordances in all four categories measured. However the directionality of this relationship is unclear. Billett suggests that there is a reciprocal relationship whereupon a learner's agency may determine how the learner perceives the affordances of the workplace; at the same time, the affordances of the workplace influences the learner's willingness to engage in activities and/or seek the guidance necessary to support his/her participation.⁹ We had postulated that student goal orientation would impact student perceptions of their workplace affordances which would ultimately impact their learning and learning outcomes. This was not borne out in our study. It is possible that student perception of the curricular goal structures and workplace affordances drive student goal orientation rather than the other way around. Pintrich describes student goal orientation as a state rather than trait. While a student's goal orientation can be a function of the student's personal characteristics, such as his/her theory of intelligence, it is also influenced by contextual factors such as the learning environment and instructional strategies.^{15,16}

Another explanation for why our results did not support our hypothesis could be that our students were predominantly mastery-oriented towards their early clinical experiences. They had a higher mean score for personal mastery goal orientation (4.27) than that previously reported for pre-clerkship students (3.93).¹⁸ It is possible that in this circumstance, student perceptions of the learning environment and not their personal goal orientations become the more important factor in their learning outcomes.

Our study results reinforce the need to attend to the learning environment and workplace affordances in early clinical experiences. Context and perceptions of context matter, including messages from the curriculum and the preceptor. Educators have control over curricular structure and to some extent workplace affordances, particularly through faculty development. The workplace affordance that had impact on student performance was its invitational quality or whether students perceived it to be a safe and welcome place to ask questions. This has implications for how we design early clinical experiences and how we prepare preceptors to work with students. For instance, curricular emphasis on the value of skills to be learned and focus on student learning and improvement rather than evaluation in the clinical workplace may ultimately result in better student learning and performance outcomes.

There are limitations to our study. We did not directly measure the workplace affordances of the preceptorship settings or the actual differences in the structures of the pre-clerkship clinical skills curricula across the four schools. Therefore we were not able to correct for the potential effect of the actual learning environment on student perception of the learning

environment. However, three of the four schools used similar ambulatory and inpatient clinical settings for their preceptorship experiences. All four schools also share a pass/not pass grading system for the pre-clerkship curricula and employ faculty evaluations as well as standardized-patient exams for student assessments. Although our study was not designed to compare student goal orientation, perceptions of the learning environment, and learning outcomes in different settings, our analysis did show varying student orientations and perceptions across institutions. Future research should explore differences among curricular structures and preceptorship settings and their potential impact on student goal orientation and performance. Different students or observers could be used to establish scores for the affordances of different workplaces to avoid the potential confounder of using the same students to provide information about the workplace as well as their personal goal orientations. Studies should also continue to investigate whether differences in goal orientation and perceptions of the learning environment have differential impact on learning outcomes.

Based on our results and conceptualization of learner agency, early medical students entering the clinical workplace are generally agentic learners. They are oriented towards learning and mastering competencies rather than merely demonstrating competence. However, their learning outcomes are subject to the influence of the curriculum and workplace. Ensuring that curricular structures emphasize learning over evaluation in early clinical experiences and that preceptors invite and encourage questions may improve clinical skills and promote continued positive workplace learning habits and outcomes.

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Chapter 8

Discussion

Medical students should be invited into the community of physicians from the very start of medical training. Early learners, defined as learners in the initial/pre-clerkship years of their medical education, should spend time in various clinical settings to learn about illness and practice skills. In addition, their work in these clinical settings should be authentic and educationally productive.¹ In 2010, one hundred years after the Flexner report, Cooke and colleagues issued a call for the major overhaul of medical education.¹ They made four key recommendations for programmatic reform. One of which was for the integration of knowledge and clinical experience, roles, and responsibilities. Specifically, they advocated for the provision of early clinical immersion to provide close connections between formal knowledge and clinical experience. Cooke and colleagues argued that segregation of the biomedical content from the experiential aspects of the curriculum results in students with a poor understanding of the context of the knowledge they are acquiring and how this knowledge can be applied in practice. The principles of situated cognition support their argument for the importance of learning in context. However, most early clinical experiences as currently provided are observational and do not engage learners in authentic, or meaningful and purposeful, activities that contribute to the care of patients.²⁻⁴ This thesis attempts to address this gap by examining several issues related to early learners and their engagement in the clinical workplace with the goal of improving early clinical experiences, curricular integration, and medical education by better situating student learning in the context of patient care.

As described in Chapter 1, learning that is situated in the workplace can be conceptualized as learning-as-participation where learning occurs through a learner's supported participation in work.⁵ Within the workplace, learners join a community of practice where their ability to participate in legitimate peripheral activities are structured by work practices and the learners' relationship with others in the community.⁶ The clinical supervisor or teacher is a member of this community and can employ specific teaching behaviors to promote participation, learning, and transfer of cognitive as well as psychomotor skills.⁷ In that sense, the clinical teacher becomes part of the workplace's affordances that invite and support learner participation.^{8,9} Other affordances include the structure of the clinical workplace and the clinical curriculum, which can further facilitate or discourage learner participation. Lastly, in Billett's framework of workplace learning, learners are active agents who can also determine their degree of participation based on their personal goal orientations and their perceptions of the workplace's affordances.⁹

From the perspectives above which emphasize the social nature of learning and learning through participation, the studies in this thesis focused on early learner activities and the practice community/workplace environment, supervisor, and learner factors that facilitate learner engagement in these activities. In particular, attention is paid to the scope of activities and levels of responsibility which can be entrusted to early learners in the clinical workplace. The following summary of our study findings is organized around the three main research questions laid out in Chapter 1:

1. Can the concept of entrustable professional activities (EPAs) be applied to early learners?

2. What would be the EPAs for early learners? What legitimate roles and activities are early learners capable of assuming in the workplace?
3. What supports are necessary to enable achievement of early learner EPAs? What are the environmental, teacher, and learner elements needed to support early learner participation in the clinical workplace?

KEY FINDINGS

Application of Entrustable Professional Activities (EPAs) to Early Learners

To consider potential workplace activities that can be entrusted to early learners, first we asked whether the concept of entrustable professional activities (EPAs) can be applied to undergraduate medical education (UME). In Chapter 2, we presented various arguments to support the use of EPAs in UME. We recommended adjustments to the current EPA model to improve its utility for UME, including the development of EPAs of smaller scope and an expansion of the 5-point entrustment/supervision scale. We also offered a new approach to thinking about UME EPAs, separating them into *core* (foundation for all GME activities), *specialty-specific* (linked to specialty-specific GME-level EPAs), and *elective* (addresses curricula in additional areas such as scholarly concentrations) categories.¹⁰ By expanding the use of EPAs to UME, we can clarify student roles and activities in the clinical workplace based on student capabilities or whether individual students may be entrusted with specific activities. This will allow students to engage in meaningful activities that truly contribute to patient care while maintaining quality and safety in the workplace.

Identification of Clinical Workplace Roles and Activities That Can Be Entrusted to Early Learners

While establishing that the concept of EPAs can be applied to UME, we also addressed the question of what workplace roles and activities can be entrusted to early learners. This required determining what early learners are actually capable of in the clinical workplace, rather than just what the current pre-clerkship curriculum allows. Therefore in Chapter 3, we asked this question in the context of first- and second-year medical student volunteers in four student-run clinics. We found early learners were capable of safely participating in patient care experiences and engaging to an extent typically reserved by medical schools for more advanced learners. They occupied central rather than peripheral roles in the clinical communities of practice and assumed direct patient care roles. They triaged patients, conducted history and physical examinations, provided patient education, and performed basic laboratory and immunization procedures. Students appeared to be able to engage to this degree due to the limited scope of patient chief complaints and clinic structure (discussed further below).¹¹ While our results are from student-run clinics at one institution, student-run clinics, which routinely rely on pre-clerkship students to provide direct patient care, are a common clinical entity in US medical schools.¹² This suggests that students are more capable of assuming legitimate patient care responsibilities and contributing to the clinical workplace than many might believe.

Using the student-run clinic study results as well as additional data from student focus groups and pre-clerkship preceptor interviews, we identified and developed five EPAs of narrow scope for entry into clerkships. Chapter 4 describes the steps taken to develop detailed descriptions and collect content validity evidence for these EPAs so that they may be operationalized by other institutions. To ensure curricular alignment, the EPAs were mapped to local curricular expectations and to EPAs developed by external agencies. Multiple workshops with internal and external subject matter experts provided additional evidence for content validity. In the workshop discussions, faculty members representing multiple institutions and various levels of medical training accepted the constructs and content domains for the five EPAs and agreed on the level of supervision (supervisor not in room, but immediately available). Through careful considerations about the levels of supervision, meaning of entrustment, and detailed specifications and limitations for each activity, the faculty were able to come to agreement on which tasks and in what circumstances early students could be entrusted to safely engage in the clinical workplace.¹³

Supports Necessary to Enable Achievement of Early Learner EPAs

Next, we examined what supports are necessary to enable early learner participation in the clinical workplace. We considered environmental, teacher, and learner elements.

Environmental Elements

In addition to determining what roles and activities early learners were capable of assuming in the student-run clinics in Chapter 3, we also asked, what affordances of the student-run clinics enabled this degree of participation. Each of the four student-run clinics had very narrow and defined scopes of practice and provided concentrated student support. They addressed a small range of presenting problems and provided limited services; for instance, one clinic only provided screening and education for one disease entity. Another important affordance was the provision of focused training and tools to prepare students to function in the clinics. Students were educated about the common health conditions, patient concerns, and health care challenges faced by the clinic's population. The clinics anticipated the range of diagnoses seen and provided on-site handbooks with information about common chief complaints and clinic protocols to further support the students.¹¹ Limiting the scope of responsibilities and then providing concentrated training and structured support for those responsibilities may be a useful strategy for enabling the successful engagement of early learners in legitimate patient care activities.

Teacher Elements

One of the most important behaviors for clinical teachers to exhibit is the ability to engage and support learner participation in legitimate patient care activities.¹⁴ To support learner participation, clinical teachers would ideally select clinical learning activities appropriate to the learner's developmental level. In Chapter 5, we examined how excellent clinical teachers approached teaching learners in situations where the clinical teachers were required to care for a panel of patients with a range of different level learners and where they needed to

balance patient care and teaching responsibilities. Our study revealed that excellent clinical teachers actively adjusted the difficulty or challenge of available learning opportunities for a learner's developmental level both to promote learner learning and to ensure patient safety. They deliberately structured and sequenced learning activities to match the capability and developmental needs of different level learners. They did this by varying the case content, managing case complexity, and adjusting their expectations of the learner. We summarized the teachers' sequencing strategies with specific suggestions for practical application which can be used by all clinical teachers to safely ensure the engagement of every learner, including early learners, in the clinical workplace.¹⁵

To understand potential faculty development needs, Chapter 6 extended the study of excellent clinical teachers to determine how these teachers developed their skills to work with different level learners in the clinical workplace. We found that the teachers' teaching practices developed from on-the-job experience and via trial and error. As their clinical and teaching confidence increased over time, their teaching approaches evolved from being teacher-centered to being more learner-centered. Clinical teachers start by applying basic teaching skills while they are honing their clinical skills. Then as patient care and teaching activities become more routine, the clinical teachers are able to shift to focusing on learners and become ready for development of additional, more specific teaching skills. From our findings, we offered two new frameworks for understanding faculty development – one of workplace-based learning of teaching skills and one of developmental sequence or growth trajectory in teaching skills.¹⁶ These frameworks provide new ways to think about potential strategies for developing clinical teachers' skills to work with different level learners and for determining when or which clinical teachers are prepared to work with early learners.

Learner Elements

We also examined the learners' contributions to their engagement in the workplace (Chapter 7). Using learner achievement goal orientation as a construct for learner agency, we conducted a multi-institutional correlational study to investigate the relationship among pre-clerkship student goal orientations toward their early clinical experiences, their perceptions of the learning environment and workplace affordances, and their clinical performance outcomes. Our results did not show a relationship between student goal orientation and student clinical skills performance on either standardized patient exams or preceptor evaluations. However, student perceptions of the curriculum as being mastery goal structured were associated with higher standardized patient exam scores. Similarly, student perceptions of their preceptorship workplace as being inviting were associated with higher evaluation scores from preceptors.¹⁷ Although we tend to think of learner performance as internal to the learners, our findings point to the important roles the external curriculum and the workplace play in learner performance.

EMERGING THEMES AND IMPLICATIONS

Themes related to the prominence of workplace affordances and curricular depth versus breadth in medical education, have emerged from our research. We will describe these themes and their implications for theory and practice in relation to curriculum development and faculty development. In addition, we will discuss other lessons learned, for instance on entrustable professional activities (EPAs), which also have implications for practice.

Workplace Affordances and Implications for Theory

Taken together our research results reinforce the social nature of learning and emphasize the important role of the clinical workplace environment on learner engagement in patient care activities and clinical learning. Cooke and colleagues stress the importance of inviting students into the community of physicians early in medical school, to promote the habit of using clinical experiences to drive learning and to build skills in social learning. They advocate for early clinical experiences which allow student access to the roles and responsibilities of physicians and student participation in clinically authentic work.¹ In Billett's framework of workplace learning, learning in the workplace results from an interaction between the learner's agency and the affordances of the workplace.^{8,9} In our study, we found that early learners were generally mastery goal oriented or agentic towards early clinical experiences and in this context, their perceptions of the learning environment and workplace affordances and not their goal orientation was the important factor in their learning outcomes.

Lave and Wenger maintain that learning opportunities within a workplace are more often structured by workplace practices than the learner's relationships with the teacher or the community.⁶ The student-run clinics provide an interesting example of clinical workplace environments where the workplace practices were dependent on early learner participation. The affordances of these workplaces were structured specifically around the capabilities and needs of early learners. These clinics created communities of practice occupied primarily by students. Here experienced student volunteers rather than supervising clinicians provided workplace continuity and occupied central roles in the communities of practice. New student volunteers took on legitimate activities and had rapid inbound trajectories with guidance from more experienced students. The students themselves created the workplace practices to ensure student participation and learning.

In workplaces not specifically designed for early learner engagement, clinical teachers as members of the larger community of practice, help regulate the participation of learners. We found that excellent clinical teachers created additional affordances in the workplace by deliberately structuring clinical learning opportunities. They sequenced and shaped activities to allow engagement of different level learners. Though Collins does describe the use of sequencing in cognitive apprenticeships, he and others have only described it as a curricular strategy.^{7,14} Our teachers applied his sequencing principles at the level of individual learner interactions to manage the opportunistic nature and breadth of workplace learning

opportunities. The addition of sequencing as a teaching method to the cognitive apprenticeship framework may be useful for future studies of learning and teaching in the workplace and of the clinical supervisor's role in the affordances of the workplace.

Depth Versus Breadth and Implications for Practice

In Chapter 3, we observed that the success of student-run clinics in engaging early learners was due to its ability to limit scope and provide the concentrated support students required for participation in legitimate patient care activities.¹¹ In essence, the behaviors of the excellent clinical teachers in our study were attempts to similarly manage the scope or breadth of the learning opportunities available in the typical clinical settings for core clinical learning. The more junior the learner, the more the clinical teachers focused the content, restricted the size and complexity of the activity, and limited their expectations to suit the learner's developmental level.¹⁵ It may be that one of the most important elements to attend to in designing early clinical experiences is the management of the scope of workplace activities through structuring of the workplace and faculty choice of learning activities.

Borrowing from these lessons on workplace affordances, we might consider helping students achieve depth of knowledge and skill in a narrow clinical area required for legitimate participation in the clinical workplace and build educational breadth over time. We could preferentially place students in subspecialty or focuses/single condition clinics and provide the relevant training for those clinics. Alternatively, we can identify the most common presenting complaints or diagnoses for a more general clinic and limit early learner encounters to patients with these complaints. Some medical schools are already following this strategy of training early learners deeply in limited areas and have found that pre-clerkship students are able to contribute to patient care as health coaches for specified health concerns and as emergency medical technician.^{18,19} This would also be consistent with the concentrated training provided to phlebotomists, who may be certified after 5 months to perform venipunctures at the same time that we require medical students require to have up to 3 years of training before they are permitted the same task.

EPAs in Undergraduate Medical Education

We can further apply the principle of depth versus breadth to the use of EPAs in undergraduate medical education (UME). In the development of early learner EPAs, we had fundamentally decided on the depth of student participation we wanted when setting a level of supervision and then narrowed the breadth of the EPAs to suit this degree of participation. Our use of a series of workshop discussions with education experts, a methodology different from the commonly reported Delphi procedure or nominal group technique for the development of EPAs,²⁰⁻²⁶ was particularly helpful for this approach. It allowed for rich discussions around what breadth of activities would be appropriate and helped generate buy-in for the depth of participation that could be expected for early learners. We were able to fine tune the breadth specifications of each EPAs and alter the perceptions of early learners as potential burdens to contributors to the workplace.

Initial thoughts on EPAs were to have a set of EPAs such as the Association of American Medical Colleges (AAMC) Core EPAs for Entry into Residency (CEPAER) which could apply to all of undergraduate medical education.²⁷ To address the degree of supervision required by medical students, we had recommended an expansion of the entrustment scale.¹⁰ The four US medical schools working with the AAMC to pilot a competency-based pediatrics training program that spans the undergraduate/graduate medical education continuum²⁸ have adopted our expanded version of the entrustment scale for use in their assessment of UME learners. However, with EPAs of larger breadth, just using the lower portion of the entrustment scale is not a good enough option. In implementing the CEPAER, the pilot schools encountered difficulties applying the CEPAER to early medical students if they needed to account for multiple contexts. The challenge is that early medical students would end up very low on the entrustment scale or be easily relegated to the status of observers because they had not yet developed the depth of knowledge and skills to achieve a specific EPA across the breadth of contexts expected for a senior medical student. A better solution would be to develop EPAs of smaller scope which look like and can nest up to the later EPAs of larger scope appropriate to more senior learners. For instance, early medical students would only need to be entrusted to perform the history and physical exam on a cooperative patient with a straightforward chief complaint. These students would then build breadth over time to include skills to work with non-cooperative patients and patients with more complex health concerns to eventually be entrusted to perform histories and physical exams on a broader range of patients.

One of our arguments for the use of EPAs in UME was that the alignment of UME/GME competency frameworks will allow for better integration across the continuum. We can use EPAs to agree on the expected competencies for learners moving from UME to GME training and to help learners who are ready, focus and prepare for the next level of training. Cooke and colleagues contend that learners should not be compelled to occupy their time unproductively repeating clinical activities once they have already mastered the competencies for those activities.¹ A group of educators in the Netherlands has applied our UME EPA framework of core, specialty-specific, and elective EPAs to develop specialty-specific EPAs for final year medical students intending to enter anesthesia and critical care residency training. Their goal is to allow medical students who achieve entrustment on these specialty-specific EPAs to enter residency training already certified in these activities and potentially shorten their residency training.

Faculty Development

Our findings regarding the evolution of faculty ability to attend to learners with clinical experience indicate that simple implementation of faculty development sessions on engaging different level learners may not work. Junior faculty members for whom patient care and teaching activities have not yet become routine, may not have the capacity to also attend to varying learner needs and new teaching strategies. It may be that we need to carefully consider how we structure teaching in the clinical workplace. For instance, perhaps junior faculty members should start by working with simpler team structures with fewer levels of

learners or preferentially be paired with more experienced faculty members. Faculty development offerings may also need to be embedded in the daily work of the faculty members and be deliberately sequenced along a faculty developmental trajectory.

Another strategy might be to apply the principles of depth versus breadth to faculty development. Rather than attempting to prepare faculty members with a breadth of skills to work in a variety of settings, we could limit the scope of faculty teaching. We could place early faculty members in only one or two teaching settings and focus their faculty development on the skills needed to teach in those specific settings. Then as they develop experience build the breadth of their teaching repertoire by adding different settings and types of learners over time. This may be particularly doable if we base faculty development in the faculty's workplace and take into account their lived experience. One could imagine a clinical workplace similar to the student-run clinics that is structured for early clinical learners with a limited scope of practice and faculty members specifically trained to work with that level learner. This would be similar to the medical student or resident clinics implemented at some institutions.

Curricular Environment

Lastly, our study of learner goal orientations reinforce the need to attend to the curriculum or learning environment and the affordances of the workplace for early clinical experiences. Our findings suggest that the learning context and learner perceptions of this context matter more than the learner's goal orientation for learner performance outcomes. The message from the early clinical skills curriculum should be mastery goal structured and emphasize the value of the skills being learned. It should focus on student learning rather than student evaluation. Also, in addition to providing faculty development on choosing the appropriate clinical opportunities with which to engage early learners, we should emphasize creation of an inviting learning environment where students feel safe to ask questions and participate. Attention to workplace practices and the implementation of early learner EPAs can help ensure students feel welcomed as active participants in the clinical workplace.

STRENGTHS AND LIMITATIONS

One of the strengths of this thesis was the use of a cohesive social learning theories lens in which to explore different facets of early learner engagement in the clinical workplace. We focused on the social nature of learning and learning as participation, and used that to understand the role of the environment, the teacher, and the learner. For instance, there are multiple ways in which to consider learner agency or motivation. Consistent use of a social learning theories lens allowed us to focus on achievement goal theory as a congruent construct.

A second strength was the use of multiple methods to address our research questions. We performed qualitative interviews using a constructive grounded theory approach, undertook an iterative process for collecting validity evidence using workshops with experts that had

similarities to crowd-sourcing, and conducted a multi-institutional quantitative study using mediation analysis. We also applied similar qualitative methods to different groups, varying our sampling strategies and use of sensitizing concepts in our interviews with volunteer students and faculty advisors in the student-run clinics and with clinical teachers in the core clinical curriculum.

There are important limitations to the work presented in this thesis. While we have made compelling and reasoned arguments as well as implementation recommendations for the use of entrustable professional activities (EPAs) in UME, and there is evidence of adoption of these recommendations, it is still to be seen how EPAs will be adapted and implemented for UME. Similarly, although we have developed early learner EPAs and garnered acceptance of them from a broad audience, they have only been recently implemented at a local level. We do not yet have evidence for how well these early learner EPAs will function practically in the pre-clerkship curriculum and in the clinical workplace.

In addition, our studies of student volunteers in the student-run clinics and clinical teachers in the core curriculum relied on self-reported behaviors. We did corroborate student reports of their clinic roles and activities with those reported by the clinic faculty advisors. However, we did not do so with the clinical teachers and their reported teaching strategies may not have been an accurate reflection of their actual teaching behaviors. Nor did we directly observe students in their engagement in the workplace or clinical teachers in their teaching.

Most of the studies were conducted in the United States. The studies on student capabilities and faculty teaching strategies were single institution studies that focused on agentic individuals – students who were volunteers and excellent clinical teachers who were proactive in their development of teaching skills. Not all students and clinical teachers fall into these categories. The results may not generalize to all students and faculty or to other institutions, particularly those outside of the United States.

Finally, our consistent use of the social learning theories lens may be seen as limitation as well as a strength. Those who view learning as being more individual than social in may argue that our focus could have resulted in not capturing other key aspects to early learner experience of clinical opportunities. For instance, a more cognitive perspective might have led to the choice of other motivation constructs for learner agency.

FURTHER RESEARCH

The findings reported in this thesis provide valuable initial information for steps that can be taken to improve early learner engagement in legitimate clinical workplace activities. However, they also call for further research into the prominence of workplace affordances and the principle of depth before breadth for learner engagement.

First, our findings for the significant impact of workplace affordances and no impact of learner agency on learner outcomes was based on the use of achievement goal orientation as a construct for learner agency. This may not have been the best construct to use. Future researchers may wish to use other constructs for learner motivation such as self-determination theory or focus more on the learners' learning behaviors in the clinical workplace to confirm the disparate impact of workplace affordances and learner agency on learning.

Our study of the student-run clinics revealed important workplace affordances related to scope that are specific to those clinics. While some of the strategies can be generalizable to other clinical settings, it would be important to look at additional clinical workplaces that invite and engage early learners. For instance, does the principle of depth before breadth hold true across settings and strategies. Identifying multiple strategies to improve workplace affordances will allow us to better understand how to structure clinical workplaces for maximal learner engagement across numerous clinical settings and health care systems.

As is noted in the limitations above, the early learner EPAs of limited scope have been implemented locally. Next steps should include the collection of additional validity evidence for their use in student assessment by the pre-clerkship curriculum as well as the preceptors in the clinical workplace. How is implementation impacted by EPA scope? Does the narrow scope encourage engagement of early learners and do early learners achieve the depth of participation anticipated? In addition, the experiences of the four medical schools who have adopted the AAMC CEPAER and our expanded version of the entrustment scale for use in assessment of UME learners should be investigated for potential insights into EPA scope, challenges of context for early learners, and additional refinements to the entrustment scale. Similarly, the development and implementation of specialty-specific EPAs for final year medical students and its impact on learner responsibilities, transitions to residency training, and potential competency-based advancement in residency should be studied. All of which can inform recommendations for how the AAMC CEPAER might be used or augmented for use in UME.

Because our findings regarding faculty use of sequencing were based on self-report, a follow-up observational study could confirm our findings for teacher selection of learning experiences for different level learners. It could also look for other ways in which faculty members might limit breadth or otherwise manipulate the workplace affordances to support early learner participation. Additionally, we had only focused on excellent clinical teachers and future work is needed to address comparisons to other teachers. All faculty members in the study had identified themselves as educators and were proactive in developing their teaching skills. We recommend exploring how typical faculty members who are not necessarily excellent clinical teachers develop skills to manage teaching challenges, the existence of potential developmental trajectories for faculty teaching skills, and how depth versus breadth might allow manipulation of those developmental trajectories.

CONCLUSION

This thesis aimed to contribute to a better understanding of the engagement of early learners in the clinical workplace in order to improve integration of early clinical experiences. The research presented demonstrated that entrustable professional activities (EPAs) can be defined for early learners and illuminated the supports necessary to allow learner achievement of these EPAs. Our findings confirmed that early learners are capable of contributing to the workplace by participating in patient care activities of narrow scope. We found broad acceptance of our work expanding entrustable professional activities (EPAs) to undergraduate medical education and of our development of EPAs of narrow scope for early learners. We also identified existing clinic structures, curricular supports, and clinical teaching strategies that facilitate early learner engagement and learning outcomes in the workplace. With the implementation of these various workplace affordances, we can optimize early learner capabilities and contributions to patient care and realize the intended goals of early clinical experiences.

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Summary

This thesis is focused on the engagement of early learners in the activities of the clinical workplace. Recent calls for medical education reform have advocated for curricular designs that are learner-centered and integrate classroom knowledge with experiential learning, achieved through workplace learning experiences. Yet, integrating early learners in the clinical workplace is difficult and rarely are they invited to participate in workplace activities. Patient contact in the initial years of medical education remains largely one of observation. The chapters in this thesis attempt to determine whether the concept of entrustable professional activities (EPAs) can be applied to early learners, to identify legitimate workplace roles and activities that can be entrusted to early learner, and to ascertain what supports are necessary to enable achievement of early learner EPAs. This information can help inform improvement strategies for the design and implementation of clinical workplace experiences for early learners.

Chapter 1 introduces the subject of early clinical experiences, including its definition, historical context, and recent trends. It addresses the different frameworks and theories for thinking about learning in the workplace and emphasizes the concept of learning as participation. The notion of workplace activities that can be entrusted to learners is discussed. The chapter concludes by highlighting the challenges faced in the curricular implementation of early clinical experiences and by posing the following research questions: 1) Can the concept of entrustable professional activities be applied to early learners? 2) What would be the EPAs for early learners? What legitimate roles and activities are early learners capable of assuming in the workplace? 3) What supports are necessary to enable achievement of early learner EPAs? What are the environmental, teacher, and learner elements needed to support early learner participation in the clinical workplace?

Chapter 2 asks whether the concept of entrustable professional activities (EPAs) can be applied to undergraduate medical education (UME). EPAs have been considered and adopted by many graduate medical education (GME) programs in their competency frameworks. This chapter discusses arguments in favor of the use of EPAs in UME. A competency framework that aligns UME and GME outcome expectations would allow for better integration across the educational continuum. The EPA approach would be consistent with what we know about progressive skill development. The key principles underlying EPAs, workplace learning and trust, are generalizable and would also be applicable to UME learners. Lastly, EPAs could increase transparency in the workplace regarding student abilities and help ensure safe and quality patient care. The chapter also outlines what UME EPAs might look like, suggesting core, specialty-specific, and elective EPAs related to residency entry expectations and learner interest. Finally, a refinement and expansion of the entrustment and supervision scale previously developed for GME is recommended, to better

incorporate the supervision expectations for UME learners. We suggest that EPAs could be operationalized for UME if UME-specific EPAs were developed and the entrustment scale was expanded.

Chapter 3 describes a qualitative study to determine the student roles and activities, and clinic characteristics that allow early learner engagement within a specific clinical workplace. We conducted semi-structured interviews with 22 first- and second-year medical student and 4 faculty volunteers at student-run clinics (SRCs), where they were asked to discuss and compare student roles in SRCs with those in the core curriculum. Thematic analysis using the sensitizing concepts of workplace learning and communities of practice revealed early learner roles in direct patient care and in clinic management. Students took ownership of patients and occupied central roles in clinic function, with faculty serving as peripheral resources. Clinic features supporting this degree of legitimate participation included defined scopes of practice, limited presenting illnesses, focused student training, and clear protocols and operations manuals. Our results show that early learners are capable of legitimately participating in patient care experiences to an extent not usually available to them. The SRCs provide one example for how we might transform early clinical experiences in the core curriculum through patient care activities of narrow scope.

Chapter 4 illustrates a multi-step process to develop and appraise the content validity evidence for entrustable professional activities (EPAs) for early learners or pre-clerkship students. We first identified content or activity domains using data from the SRC study and additional student focus groups and faculty interviews. To ensure content relevance and adequacy, we mapped each domain to pre-clerkship course objectives, graduation competencies, and resident-level EPAs. We then developed, with expert consultation, full EPA descriptions for each domain with activity specifications; expected knowledge, skills, and attitudes; associated competencies; and assessment information. To verify further, the appropriateness of content as well as the supervision level, we conducted local, national, and international workshops before finalizing each EPA with additional expert and stakeholder review. This process resulted in the development of five EPAs of narrow scope for pre-clerkship students: 1) information gathering, 2) information integration for differential diagnosis, 3) healthcare team communication, 4) information sharing with patients, and 5) resource identification. Entrustment was characterized by supervision where the supervisor was outside the room but immediately available. The development of these EPAs indicates support for pre-clerkship student engagement in clinical workplace activities and for EPAs in setting a standard for early clinical experiences and entry into clerkship.

Chapter 5 explores how clinical teachers select clinical learning activities or experiences to support the workplace participation and development of different level learners. We conducted semi-structured interviews with 19 faculty members identified as excellent clinical teachers teaching multiple levels of learners. We asked about their teaching approach and perceived role in promoting learner development. Through thematic analysis, we identified three themes related to their teaching approach: sequencing of learning experiences, selection of learning activities, and teacher responsibilities. All teachers used *sequencing* as a teaching

strategy by varying content, complexity, and expectations by learner level. The teachers initially *selected learning activities* based on learner level and adjusted for individual competencies over time. They identified *teacher responsibilities* for learner education and patient safety, and used sequencing to promote both. Our results demonstrate that excellent clinical teachers employ strategies to match available learning opportunities to learners' developmental levels. Use of these strategies may help all clinical teachers safely engage early learners and improve their learning in the clinical workplace.

Chapter 6 reports further research using additional data collected as part of the larger interview study described in Chapter 5. This study examined how clinical faculty members develop the skills to work with different level learners. Here we asked participants how they developed their approach to teaching and how their teaching evolved over time. We found the following themes in our thematic analysis: teacher agency and work-based learning of teaching strategies, developmental trajectory of clinical teachers, and interplay between clinical confidence and teaching skills. Faculty members cited on-the-job experiences and trial and error as key informers of their teaching practices. They moved from being teacher-centered to being more learner-centered as their clinical and teaching confidence increased. They also identified continued faculty development needs, requesting attention to the developmental trajectory of learners and themselves as teachers. This study reveals the importance of workplace learning for faculty members for the development of teaching skills not typically addressed in faculty development offerings (e.g. teaching multiple level learners). To prepare faculty members to teach early learners in the clinical setting, we should consider workplace learning opportunities for faculty members and formal faculty development offerings that follow a developmental trajectory.

Chapter 7 describes a multi-institutional prospective correlational study investigating the relationship among students' goal orientations toward early clinical experiences, their perceptions of clinical workplace affordances, and their clinical performance outcomes. 296 of 517 (57.3%) students completed a survey about their personal goal orientations and their perceived goal structure of the pre-clerkship clinical curriculum, and their pre-clerkship clinical experiences. We were able to link the survey responses of 253 (85.5%) students to student evaluations from their clinical preceptors and their scores on a standardized patient exam at the end of their pre-clerkship curricula. Data analysis revealed that pre-clerkship students hold a predominant mastery goal orientation emphasizing learning. There was no relationship between student goal orientation and performance outcomes. However, mastery-oriented students perceived their curriculum as mastery-structured and the clinical workplace as having more affordances. Students who perceived the curriculum as mastery-structured performed better on the standardized patient exams and students who perceived the clinical workplace as more inviting in its affordances received higher evaluation scores. Educators should consider how curricular designs and expectations for early clinical experiences, and the alignment of curricular, preceptor, and student goals can promote perceptions of a mastery-structured curriculum and inviting clinical workplace.

Chapter 8 summarizes the key findings of this thesis and returns to the frameworks of learning in the workplace introduced in Chapter 1. We discuss what we have learned about early learner engagement in the workplace and how these findings address and advance our understanding of our three main research questions listed above. We describe the emerging themes of the prominence of workplace affordances and curricular depth versus breadth in the successful implementation of early clinical experiences, explore their implications for both theory and practice, and make recommendations for curriculum and faculty development. Both the strengths and limitations of this body of work are addressed. Finally, we suggest directions for future research.

Samenvatting

Dit proefschrift gaat over het inschakelen van beginnende studenten bij activiteiten in de klinische werkplaats. Recente oproepen tot hervorming van medisch onderwijs pleiten voor student-gecentreerde curricula en integratie van theoretische kennisverwerving met leerervaringen in de klinische werkplaats. Het integreren van jongerejaars studenten in de klinische werkplaats is echter moeilijk en jonge studenten worden zelden uitgenodigd om serieus deel te nemen aan klinische activiteiten. In de eerste jaren van het medisch onderwijs blijft hun contact met de patiënt grotendeels beperkt tot observatie. De hoofdstukken in dit proefschrift exploreren in hoeverre het concept van *entrustable professional activities* (EPA's) kan worden toegepast bij jongerejaars studenten, welke legitieme rollen en professionele activiteiten in de klinische werkplaats aan de beginnende student kunnen worden toevertrouwd, en welke ondersteuning er nodig is om te zorgen dat de beginnende student in staat is aan de EPA-verwachtingen te voldoen. De studies zijn gericht op strategieën voor de verbetering van planning en realisering van leerervaringen in de klinische werkplaats voor jongerejaars studenten.

Hoofdstuk 1 introduceert het onderwerp van vroege klinische ervaringen, inclusief definitie, historische context en recente trends. Het behandelt de verschillende kaders en theorieën over leren in de werkplaats en benadrukt het concept van leren als participatie. Het idee van de werkplaatsactiviteiten die kunnen worden toevertrouwd aan de leerlingen wordt besproken. Het hoofdstuk sluit af door te wijzen op de uitdagingen in curriculaire implementatie van vroege klinische ervaringen en door het stellen van de volgende onderzoeksvragen: 1) Kan het concept van entrustable professionele activiteiten worden toegepast bij beginnende studenten? 2) Wat zouden de EPA's voor beginnende studenten kunnen zijn? Welke legitieme rollen en activiteiten zijn beginnende studenten in staat te vervullen in de werkplaats? 3) Welke ondersteuning is noodzakelijk om de verwezenlijking van EPA's voor de beginnende student mogelijk te maken? Welke kenmerken van de context van docenten en van studenten zijn nodig om participatie van jongerejaars studenten in de klinische werkplaats te ondersteunen?

In **Hoofdstuk 2** staat de vraag centraal of het begrip *entrustable professional activities* (EPA's) kan worden toegepast in de medische basisopleiding. EPA's worden vooral in medische vervolgoopleidingen overwogen en gerelateerd aan hun competentieraamwerken. Dit hoofdstuk bespreekt de argumenten voor het gebruik van EPAs in de basisopleiding. Een competentieraamwerk dat de verwachtingen in de basisopleiding en de vervolgoopleiding op één lijn plaatst zal zorgen voor een betere integratie in het medisch opleidingscontinuüm. De EPA-aanpak lijkt overeen te stemmen zijn met wat we weten over progressieve ontwikkeling van vaardigheden. Belangrijke uitgangspunten van de EPA's - werkplaatsleren en vertrouwen - zijn generaliseerbaar en ook van toepassing bij studenten geneeskunde. Ten slotte zouden

EPAs de transparantie over vaardigheid van studenten op de werkplek kunnen vergroten en zo bijdragen aan de waarborging van veiligheid en kwaliteit in de patiëntenzorg. Het hoofdstuk beschrijft ook hoe studenten-EPA's eruit zouden kunnen zien, met voorbeelden voor kern EPA's, specialisme-specifieke EPA's, en electieve EPA's, in lijn met verwachtingen vanuit medische vervolgoopleidingen en de interesse van de student. Ten slotte wordt een verfijning en uitbreiding van de vertrouwens- en supervisieschaal, eerder ontwikkeld voor de vervolgoopleidingen, aanbevolen, om het toezicht en de verwachtingen voor studenten beter weer te geven. Wij stellen dat EPA's kunnen worden geoperationaliseerd voor basisopleiding als EPA's gespecificeerd worden en de bestaande vertrouwens- en supervisieschaal wordt uitgebreid.

Hoofdstuk 3 beschrijft een kwalitatief onderzoek naar de rollen en activiteiten voor de student, en de kenmerken van de kliniek, die de inschakeling van beginnende studenten in een specifieke klinische werkplek mogelijk maken. Wij voerden semi-gestructureerde interviews met 22 eerste- en tweedejaars studenten geneeskunde en 4 docenten die als vrijwilligers in door studenten georganiseerde klinieken (Student Run Clinics of SRC's¹) werken. Ze werden gevraagd om de facultatieve studentenrollen te beschrijven in de SRC's en die te vergelijken met hun rollen in het reguliere medische curriculum. Thematische analyse met behulp van de kernconcepten van werkplaatsleren en *communities of practice* leverde SRC rollen op voor de beginnende student in de directe patiëntenzorg en in het management van deze poliklinieken. Studenten namen verantwoordelijkheid voor patiëntenzorg en vervulden een centrale klinische rol, terwijl de docenten perifere ondersteuning verleenden. Karakteristieken van een klinische werkplaats die dit niveau van *legitimate participation* toelaten zijn een welomschreven, beperkte praktijkvoering, een beperkte variatie van gepresenteerde ziektebeelden, een gefocuste training van studenten, en duidelijke protocollen en handleidingen. Onze resultaten tonen aan dat beginnende leerlingen in staat zijn legitiem deel te nemen aan patiëntenzorg op een niveau dat doorgaans niet voor hen beschikbaar is. De SRC's bieden een voorbeeld hoe we vroege klinische ervaringen in het reguliere curriculum zouden kunnen transformeren via patiëntenzorgactiviteiten met beperkte reikwijdte.

Hoofdstuk 4 illustreert een stapsgewijze procedure voor het ontwikkelen en realiseren van het inhoudsvaliditeit van entrustable professionele activiteiten (EPA's) voor geneeskundestudenten bij klinische ervaringen voorafgaand aan de volwaardige coassistentschappen. Met gegevens uit de SRC-studie en aanvullende studentenfocusgroepen en interviews met docenten hebben we eerst de inhoud en domeinen van activiteit vastgesteld. Om ervoor te zorgen dat de inhoud relevant en toereikend is, werd elk domein gekoppeld aan leerdoelen en afstudeercompetenties, en vergeleken met EPA's in de vervolgoopleidingen. Vervolgens ontwikkelden we, met expert-consultaties, volledige EPA-beschrijvingen voor elk domein met een specificatie, verwachtingen qua kennis, vaardigheden en attitude, bijbehorende competenties en informatiebronnen voor beoordeling.

¹ SRC's worden in de VS toegepast om poliklinische medische hulp te bieden aan populaties zonder verzekering of groepen die op andere wijze buiten de reguliere gezondheidszorg vallen.

Om de geschiktheid van de inhoud en het niveau van supervisie verder te verifiëren voerden we vóór de afronding van elke EPA-beschrijving lokale, nationale en internationale workshops uit met input van belanghebbenden en experts. Dit proces leidde tot de ontwikkeling van vijf EPA's met een beperkte reikwijdte voor studenten voor het begin van de coschappen: 1) verzamelen van informatie, 2) informatie-integratie voor de differentiële diagnose, 3) rapportage aan het medische team, 4) delen van informatie met de patiënten, en 5) identificatie van methoden om de individuele zorg te optimaliseren. Bekwaamverklaring werd vastgesteld op het niveau van supervisie waarbij de supervisor niet in de ruimte aanwezig hoeft te zijn, maar wel direct beschikbaar. De ontwikkeling van deze EPA's ondersteunt de betrokkenheid van studenten bij activiteiten in de klinische werkplaats voor het begin van de volwaardige coschappen, en stelt een standaard voor vroege klinische ervaringen en toegang tot de coschappen.

In **Hoofdstuk 5** wordt onderzocht hoe klinische docenten klinische leeractiviteiten of ervaringen selecteren om werkplek participatie en ontwikkeling van leerlingen op verschillende niveaus te ondersteunen. Wij hielden semi-gestructureerde interviews met 19 docenten die bekend stonden als uitstekende klinische leerkrachten met leservaring aan studenten van verschillend niveau. We vroegen over de manier van lesgeven en de perceptie van hun rol in het bevorderen van de ontwikkeling van de student. Door middel van thematische analyse identificeerden we drie thema's die verband houden met hun manier van lesgeven: sequentiëren van leerervaringen, selectie van leeractiviteiten, en docentverantwoordelijkheden. Alle docenten gebruikten *sequentiëren* als een pedagogisch strategie door het variëren van de inhoud, complexiteit en verwachtingen naar student-niveau. De docenten kozen in eerste instantie *leeractiviteiten* gebaseerd op student-niveau en maakten aanpassingen voor individuele competenties in de tijd. Zij identificeerden *docentverantwoordelijkheden* voor het onderwijs van de student en de veiligheid van de patiënt, en gebruikten volgordekeuzes om beide te bevorderen. Onze resultaten tonen aan dat klinische docenten die als uitstekend bekend staan de beschikbare leermogelijkheden aanpassen aan het niveau van de student. Het gebruik van dergelijke strategieën kan klinische docenten helpen om beginnende studenten veilig bij de klinische werkplaats te betrekken en hun leren in de werkplaats te verbeteren.

Hoofdstuk 6 rapporteert over verder onderzoek met behulp van aanvullende gegevens, verzameld in het kader van de interviewstudie beschreven in hoofdstuk 5. In deze studie wordt onderzocht hoe klinische docenten hun vaardigheden ontwikkelen om met studenten van verschillende niveaus te werken. Hiervoor vroegen wij de deelnemers hoe zij hun visie op onderwijs hadden ontwikkeld en hoe hun onderwijs geëvolueerd is in de tijd. We vonden de volgende thema's in onze thematische analyse: docenteninitiatief en het leren van doceerstrategieën in de werkplaats, ontwikkelingstrajecten van klinisch docenten, en de wisselwerking tussen vertrouwen in klinische vaardigheid en doceervaardigheid. De docenten noemden *on-the-job* ervaringen en *trial and error* als belangrijke informatiebronnen voor hun onderwijspraktijk. Met de toename van klinische en onderwijs-zelfverzekerdheid veranderde hun handelen van docent-gecentreerd naar meer student-gecentreerd. Ze constateerden ook dat een docent zich voortdurend moet ontwikkelen, met speciale

aandacht voor het ontwikkelingstraject van de studenten en van zichzelf als docenten. Deze studie toont het belang van het leren op de werkplek voor docenten voor de ontwikkeling van didactische vaardigheden, die meestal niet aan bod komen in het gebruikelijke aanbod voor docentprofessionalisering (zoals onderwijs aan studenten variëren naar niveau). Om docenten voor te bereiden op het lesgeven aan beginnende studenten in de klinische setting moeten we mogelijkheden voor werkplekleren voor docenten in beschouwing nemen en docentprofessionalisering aanbieden dat een logisch ontwikkelingstraject volgt.

Hoofdstuk 7 beschrijft een multi-institutioneel, prospectief, correlatieel onderzoek naar de relatie tussen de doeloriëntatie van de studenten gerelateerd aan vroege klinische ervaringen, hun perceptie van wat de klinische werkplek toelaat, en hun klinische prestaties. 296 van de 517 (57,3%) studenten vulden een enquête in over hun persoonlijke doeloriëntaties en hun perceptie van de doelen van het pre-coschappen klinisch onderwijs, en over hun pre-coschappen klinische ervaringen. De antwoorden van 253 (85,5%) studenten konden gekoppeld worden aan studentenevaluaties van klinische docenten en aan hun scores in een vaardigheidsexamen met simulatiepatiënten aan het einde van hun pre-coschappen fase. Data-analyse toonde aan dat pre-coschappen studenten voornamelijk gericht zijn op *mastery* als doel. Er was geen relatie tussen doelgerichtheid en prestaties van studenten. Echter, *mastery*-georiënteerde studenten ervaren hun curriculum ook als *mastery*-gestructureerd en de klinische werkplek als een plaats dat meer toestaat. Studenten die het curriculum als *mastery*-gestructureerd zagen presteerden beter op de gestandaardiseerde patiënt examens en studenten die de klinische werkplek als meer *inviterend* zagen scoorden hoger op evaluaties. Docenten moeten nagaan hoe curriculumontwerp, de verwachtingen over vroege klinische ervaringen, en de onderling afstemming van curriculumdoelen, doelen van docenten en doelen van student de perceptie van een *mastery*-gestructureerd curriculum en een *inviterende* klinische werkplek kunnen bevorderen.

Hoofdstuk 8 geeft een samenvatting van de belangrijkste bevindingen van dit proefschrift en keert terug naar de kaders van het leren op de werkplaats die geïntroduceerd zijn in hoofdstuk 1. We bespreken wat we met deze studies geleerd hebben over de betrokkenheid van de beginnende student in de werkplaats en hoe deze bevindingen ons begrip van onze drie belangrijkste onderzoeksvragen, zoals hierboven vermeld, vergroten. We verkennen hun implicaties voor zowel theorie als praktijk, en doen aanbevelingen voor ontwikkeling van curricula en voor docentprofessionalisering. Zowel de sterke punten als de beperkingen van de studies worden besproken. Tot slot stellen we richtingen voor toekomstig onderzoek voor.

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Curriculum Vitae

Carrie Chen was born in 1969 in Pingtung, Taiwan and grew up in California in the United States. She earned her bachelor's degree in biochemistry at the University of California Berkeley. She then completed medical school, pediatric residency, and a chief residency at the University of California San Francisco (UCSF). Her interest in education began during her chief residency, when she welcomed the responsibility for delivering and managing parts of the residency curriculum. Upon completion of her medical training, she explored her interests in education by pursuing a master's degree at the Rossier School of Education at the University of Southern California. In 2011, she began her PhD in the UCSF - Utrecht University collaborative doctoral program in health professions education.

Carrie has had a faculty appointment at the UCSF School of Medicine for 16 years, during which she has undertaken various roles in medical education. She was assistant director of the pediatric residency program prior to directing the pre-clerkship doctoring course, which sparked her interest in early clinical experiences. She currently holds the Abraham Rudolph Endowed Chair in Pediatric Education and directs the pediatric clerkship. She is also director of a scholarly concentration program in health professions education, and has been leading the development of a new inquiry curriculum and program for the UCSF School of Medicine. She continues to practice in the general pediatric acute care clinic where she has the pleasure of working with learners of all levels.

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