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INTRODUCTION

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The clinical learning environment

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ABSTRACT

Learning in a clinical context is foundational in the training of health professionals; there is simply no alternative. The subject of the clinical learning environment (CLE) is at the forefront of discussions. In this introduction to a themed issue on the CLE, we present an expanded conceptual model that approaches the CLE through six different lenses, termed "avenues:" architectural, digital, diversity and inclusion, education, psychological, and sociocultural, with each avenue represented by a paper. The aim is to facilitate dialog around the contributions of different academic disciplines to research on the CLE. Collectively the papers highlight the overlap between the various "avenues" in how they influence each other, and how they collectively have shaped the work to understand and improve the CLE. The expectation is that the various avenues can add to existing knowledge and create new ideas for interventions to improve the clinical learning environment across nations for learners and teachers with the ultimate aim of improving patient care. Research and efforts to improve the CLE are critical to learning, professional socialization and well-being for trainees as they learn and participate in patient care, and to the quality of care they will deliver over decades of practice after graduation.

The subject of the clinical learning environment (CLE) is at the forefront of discussions by educators, accreditors, educational organizations, and health care professionals and has long been a focus of research and improvement efforts in medical education. A suboptimal CLE has been associated with adverse patient care and learning outcomes (GMC 2016; Kilty et al. 2017; Gruppen et al. 2018; Macy Foundation 2018). The current climate of financially constrained and understaffed health systems has increased pressure and expectation of, and negative consequences for trainee well-being. Financial constraints and clinical productivity expectations have negatively affected available time for educational pursuits (Norman and Dogra 2014; Kilty et al. 2017; Weiss et al. 2018) and have contributed to higher levels of stress, burnout, depersonalization, and emotional exhaustion in medical trainees and in their teachers (Gruppen et al. 2018; Macy Foundation 2018). This in turn has added negative effect on the working and learning climate for trainees and their trainers.

Learning in a clinical context is foundational in the training of health professionals; there is simply no alternative. Simulation may prepare learners for the CLE; however, there is no comparison to the learning that comes from managing patients in a real clinical context. In addition, many healthcare systems rely on the service that learners provide to patients, and to remove them from teaching institutions may have a negative impact on patient care.

An effective and supportive CLE thus is important to the quality and safety of patient care, to the health and well-being of the medical workforce, and to trainee learning and socialization into the profession. Studies from North America have shown that the quality of the learning environment that provided the context for training was a predictor of the quality of care provided by graduates for years after graduation (Tamblyn et al. 2005; Asch et al. 2009) and influenced prescribing patterns (Cadieux et al. 2007) and patient management and use of health care resources (Chen et al. 2014; Sirovich et al. 2014; Dine et al. 2015). Similarly, complication rates for practicing general surgeons were associated with the ranking of the residency program in which they had trained—with higher ranked residency programs correlated with lower complication rates (Bansal et al. 2016). Therefore, efforts to improve the CLE not only have a positive impact in the settings where trainees learn and participate in patient care but also affect the practice of future graduates, potentially for decades to come. This provides the rationale for Clinical Learning Environment Review (CLER) program in the United States, as physicians in training represent both frontline of health care delivery today and the future of the practice of medicine (Weiss et al. 2013, 2018). The importance of the CLE to both the current and future practice of medicine raises two critical questions: (1) what is known about the CLE from prior scientific study; and (2) what can be done in the short- and the long-term to increase the effectiveness of the CLE as the critical site for physician education, and how this in turn, has a positive impact on the well-being, engagement, and professional socialization of learners and their teachers. This themed issue of *Medical Teacher* is devoted to these topics.

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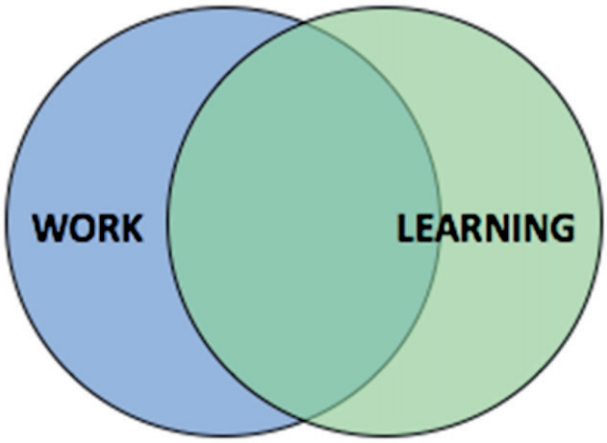

Figure 1. The CLE constitutes the overlap between the domains of work and learning and their congruent and competing rationales.

The clinical learning environment–An elusive concept

Clinical learning environments involve three key elements: clinical work; learning; and environment. Early definition focused on the climate and overall ambiance of the medical education environment (Genn and Harden 1986) and highlighted the importance of the climate in which learning occurs (Roff and McAleer 2001). The CLE has been described as foundation of postgraduate medical education (Weiss et al. 2013; Kilty et al. 2017) by comprising "the social, cultural and material context is which residents learn while they work" (Kilty et al. 2017, p. 1) The Macy Foundation (2018) defined the learning environment as: "…social interactions, organizational cultures and structures, and physical and virtual spaces that surround and shape participants' experiences, perceptions, and learning." These differences in existing definitions highlight the complexity of the CLE concept, with different dimensions and elements examined in prior studies and editorials (e.g. environment, climate, atmosphere, milieu, and culture).

In this thematic examination, we take a pragmatic stance and define the CLE as the overlapping space between the "work environment" (the clinical context in which trainees learn and participate in patient care), and the "educational context" (the syllabi, curricula, and goals that define methods for learning, expected learning outcomes, and assessment practices), shown in Figure 1.

A historical perspective on assessment of the learning environment

Kurt Lewin's research in social psychology in the 1930s and 1940s (Lewin 1947) laid the foundation for the development of instruments to measure educational climates (Genn and Harden 1986 and Palmgren 2016). Researchers examined factors such as stressors, pressure, and rewards in relation to what characterized specific educational environments (Genn and Harden 1986; Palmgren 2016). This set in motion a series of initiatives that aimed to measure quantifiable elements of environments, allowing for longitudinal and comparative studies on learners' and teachers' perceptions. Early instruments included the Medical School Environmental Index (Hutchins 1961), which was adopted by the Association of American Medical Colleges for the

Figure 2. The "avenue" framework to deconstruct and explore fundamental aspects of clinical learning environments.

assessment of the medical student learning environment. These studies showed that learners' perceptions of their environment "were essentially unrelated to, or were independent of the students' personality needs" (Genn and Harden 1986).

As many of the existing instruments for assessing the learning environment were in the field of general education, Genn and Harden (1986) identified the need to create instruments specific to health professions education. This led to the development of a new, global and culturally nonspecific measurement of the educational climate in health professions education—the Dundee Ready Educational Environment Measure or DREEM (Roff et al. 1997)—a 50-item measure of students' perception of a specific environment allowing for various forms of comparative assessments of the learning environment. The development of the DREEM was timely. The first *Tomorrow's Doctor* report published by the General Medical Council in the UK opened a critical dialog on the suboptimal conditions under which medical students were trained (GMC 1993). The report highlighted problems such as bullying, gender discrimination, harassment, quality of supervision and the presence of poor role models among clinical teaching faculty, bringing the enterprise of clinical learning environments to the attention of educators and regulators (Roff et al. 2005 and Palmgren 2016) Ultimately, this was a patient safety issue with a potentially devastating impact on the public's trust in the profession.

Instruments for measuring clinical learning environment for postgraduate medical education have also been developed, with the Postgraduate Hospital Educational Environment Measure (PHEEM) one of the most widely used and validated instruments (Roff et al. 2005). Studies of the use of the PHEEM across contexts found variability by specialty, level of training and clinical settings, as well as validating the instrument in different national contexts (Chan et al. 2016). Instruments for assessing the CLE also

exist for some specialties, such as anesthesiology and surgery (Roff et al. 2005; Kanashiro et al. 2006), and for non-physician health professions (Palmgren 2016).

Parallel to the movement to enhance assessment of the learning environment, ripples of change were felt in the United States as a result of the 1984 death of Libby Zion in a New York teaching hospital, with long working hours and inadequate supervision cited as contributing factors (Barron 2006). In 1989, the New York State' health regulation Section 405 enforced work hour limits for physicians in training of 80 hours per week (Asch and Parker 1988). The ground-breaking report *To Err is Human* by the Institute of Medicine in the United States placed patient safety on the public agenda with an impact on expectations for safety and quality of care, and on training regulations (IOM 2000), and the associated dialog highlighted the conditions under which health care professionals were being trained and the culture in which training was imbedded. Under pressure from pending legislation, the ACGME instituted a national limit on work hours for physicians in training (Philibert et al. 2002). In Europe, implementation of the European Working Time Directive in 1998 severely reduced the working hours of physicians in training (Datta and Davies 2014), with mixed reactions from the medical community (Maisonneuve et al. 2014), indications of a negative impact on training, particularly in surgical specialties (Hopmans et al. 2015), and little evidence of improvement in trainee working conditions and well-being (Rodriguez-Jareño et al. 2014). These increased the need for valid and actionable assessment of the learning environment to assess the impact of these changes and to facilitate improvements.

Assessments of the learning environment currently are used by accreditors in undergraduate medical education in the United States and Canada (LCME 2018; Mavis et al. 2014; Lockwood et al. 2004) and by the US accreditation body for postgraduate medical education (the Accreditation Council for Graduate Medical Education) as an important, sensitive and valid tool to collect learners' and teachers' perception of the learning environment in the US and internationally (Holt et al. 2018; Ibrahim et al. 2014). The results are used in accreditation and internally for program improvement. When the US accreditation body for postgraduate medical education (the Accreditation Council for Graduate Medical Education) launched a new accreditation system in 2013, this included both learner and teaching faculty assessments of the CLE in annual data screening for programs trainees, and a dedicated review of the CLE through the Clinical Learning Environment Review (CLER) program (Wagner et al. 2016; Co et al. 2018; Weiss et al. 2018). Learner and teacher assessments of the CLE impact learning outcomes, with noncompliance in internal medicine programs identified via the ACGME's annual surveys associated with lower performance on graduates on the board certification examination. The CLER program both provides insight into and feedback on, strengths and challenges in US-accredited institutions' learning environment, as well as a window into the future practice and practice style of graduates. Despite relatively recent implementation, CLER has provided a powerful tool to leverage institutional and health system-level change (Weiss et al. 2018).

Current challenges in the learning environment

There are currently significant challenges in the learning environment. A national stakeholder consensus document identified overcrowded clinical environments, understaffing and service pressures and clinical workload as barriers to learning in the CLE (Kilty et al. 2017). Consistent with other studies, the domains identified as most challenging from an improvement perspective were the "*organization and conditions of work*" and "*time to learn with senior doctors during patient care*" (Kilty et al. 2017). The Bawa-Garba case in the United Kingdom is a poignant example of this (Vaughan 2018). This case and similar general observations further support the hypothesis that "service pressures impact opportunities to learn, resulting in cognitive overload, limiting time to reflect and discuss and through constraints on physical space" (Kilty et al. 2017, p. 8).

> In April 2018, the Macy Foundation organized a conference to address challenges and improve the environment for learning in the health professions, which framed the critical issues as:" … revolutionary changes in the health care delivery; increasing demands on practitioners to increase clinical productivity and improve patient safety and quality of care; structural systems of inequities and exclusion and health disparities. Among health profession learners, educators, and practitioners, these trends are producing increasing rates of burnout, distress, and depression." (Macy Foundation 2018).

The Macy Foundation also commissioned a scoping review of the current literature on interventions designed to improve learning environments in the health professions (Gruppen et al. 2018). The review introduced a conceptual model that deconstructed the CLE into four central components (personal, social, physical and virtual, and organizational). It also highlighted that, despite considerable academic efforts, there is a lack of conceptual clarity in studies that have explored the clinical learning environment (Gruppen et al. 2018).

Introducing the avenues framework

Our overview of the study of the CLE from the 1930s to the present day shows that focus on the CLE and on the conditions under which physicians (and to some degree other health professional are being trained), intermittently reemerge at the forefront of investigative work, dialog within the educational community, and public and political discussions. There are internal and external reasons. Externally, drivers of the dramatic increase in interest in the CLE over the past two decades include challenges to the quality and hours, bullying and suppressing learning culture, stress and burnout, as a host of factors with the potential for having a serious deleterious effect on health care and health professions training. This is recognized by the education community, and by regulators, accreditors and the public, resulting in calls for change and improvement. Less well understood by the public is the impact the CLE has on the subsequent practice of graduates, which is a critical internal driver for the medical education community to better understand and effect positive change in the learning environment.

While much has been done at an academic and policy level to identify challenges, levers for action and recommendations for the future of the CLE, the question, "What

Table 1. Chronological overview of the clinical learning environment "avenues" and public trust concerns.

CLE avenue	Prior to 1960	1960–1979	1980–1999	2000–2009	2010–to present
Architectural	1850s Florence Nightingale identified the impact of the physical environment on care of soldiers wounded during the Crimean War[1]	1969 Special Issue the Harvard draws attention to the importance of the architectural space in education[2]	1984 Ulrich paper in Science about the association of physical space and recovery in hospitals[3]	2007 Temple's review of the literature on learning spaces[4]	2015 Nordquist and Laing about the networked learning landscape[5] and alignment of learning space and curriculum[6] 2016 AMEE Guide 107 on physical learning space development[7] 2016 Nordquist scoping review on learning spaces[8]
Digital			1990 Huber recognizes the impact of information technology on the organization of work[9]	2003 US regulates the privacy and confidentiality of patient information used in patient care[10] Concerns about safety and privacy of digital patient information used in education	Concerns about the use of social media and open data sources in patient care and medical education 2015 Concerns about the use of trainee reflections in medico-legal contexts (the Bawa-Garba case)
Diversity and Inclusion	1910 United States Flexner report resulted by 1923 in the closure of 10 of 12 traditionally Black Medical Schools[11]	1961 US Presidential Executive Order establishes "Affirmative Action" to increase representation of minorities in higher education and the workplace[12]	Positive Action (United Kingdom) and Employment Equity (Canada, South Africa) US Challenges to Affirmative Action[13] Diversity and Inclusion as principles of ethics and fairness	US Holistic Admission Policies for undergraduate medical education 2007 UN Declaration of the Rights of Indigenous Peoples[14] Reconciliation Programs for Members of Indigenous Groups (Canada,[15] Australia, New Zealand)	Recognition of continuing challenges for minority patients and trainees, including racial, ethnic and sexual minorities, and for women in reaching leadership positions Diversity and inclusion as attributes of excellent education organizations[16]
Education and Measurement	1953 first peer accreditation review of postgraduate programs in the US[17]	1960 first measurement of LE in undergraduate medical education in the US	1992 Fleming and Mills identify four learning styles[18] 1997 DREEM 1999 Introduction of Competency-Based Education[19]	2005 PHEEM 2006 ACGME Resident and 2009 Faculty Surveys	2013 CLER 2016 GMC Report 2017 Irish Consensus Conference on the CLE 2018 Macy Foundation CLE Report
Psychological	The psychology of learning, including classical conditioning (Pavlow)[20], operant conditioning (Skinner)[21] and observational learning (Vygotsky)[22]	Application of learning psychology in general education	Application of learning psychology such as Self-efficacy Theory[23] and Social Cognitive Theory[24] in medical education	Cognitive Load Theory in learning in a clinical context[25]	Psychological Safety in the CLE Positive Psychology and Resilience Trainee and Physician Wellness and Well-being
Socio-cultural	1938 Dewey's recognition that education must entail real experiences and "lead out into an expanding world"[26] 1957 First Study of the Undergraduate Learning Environment[27]	1978 First Study of the Postgraduate Learning Environment (in surgery)[28]	Growing focus on role of the CLE in shaping practice 1994 Initial focus on the "Hidden Curriculum"[29]	US and Europe changes in trainee work and learning under work hour limits Physician Burnout,[30] including trainee burnout[31]	Trainee and faculty burnout and work disengagement[32]
Public Trust Concerns		Adequacy of the physician workforce	Adequacy and Specialty Distribution of the Physician Workforce[33] Physician work hours and patient safety	Tomorrow's Doctor Triple Aim (Patient Experience, Cost of Care, Population Health)[34]	Clinical Skills of Graduates Physician Burnout, XIV including trainee burnoutXV

is next?" remains largely unanswered. What do these challenges look like practically, within a given institution, and how can the educators, the profession and accreditors and regulators affect positive change?

In October 2018, the Royal College of Physicians and Surgeons of Canada hosted a global consensus conference on the clinical learning environment, held just prior to the International Conference on Residency Education. Attendees at the conference were from a number of different countries and backgrounds, adding to the richness and candidness of the discussions. The objectives of this conference were to reflect on the current literature, identify gaps in the current body of knowledge, and delineate tangible short- and longer-term goals towards improving clinical learning environments. Based on the literature, a group of experts used an informal consensus approach to develop a conceptual model to deconstruct clinical learning environment, using work in established academic disciplines, to better understand the various aspects and attributes. The model approaches the CLE through six different lenses, which we have termed "avenues" for this exploration (Figure 2). The conference provided a forum for discussion and identification of connection and overlap between the various avenues in how they influence each other and the CLE. Six papers presented in this themed issue are the outcome of these discussions and address the various avenues of the model.

To examine how different academic fields and foci have informed the study of the CLE, in Table 1, we highlight the history of the study of the CLE using the six avenues, along with current challenges and salient points, and critical topics of interest to the public. These topics are discussed in detail in the individual papers. In each paper, we seek to identify actionable areas for research and improvement efforts that have the potential for positive impact on the quality and safety of care, trainee learning, and well-being, and though the link to their performance as graduates, the public's trust. Each paper also provides actionable "Practice Points" for the avenue it addresses.

Conclusions

While a thorough examination of the clinical learning environment is important, by itself it is insufficient. There is a need to identify strategies and approaches that allow the medical education community and the profession to improve the environment that provides the context for physician education. This themed issue of *Medical Teacher* builds on and seeks to expand the existing, somewhat fragmented understanding of the clinical learning environment. The expectation is that the various avenues within the theme can add to existing knowledge, and create new ideas for interventions to improve the clinical learning environment across nations for learners and teachers with the ultimate aim of improving patient care. Given what is known about the role of the CLE, further study and efforts to improve the CLE are critical to the learning, professional socialization and well-being of trainees as they learn and participate in patient care, and to the future quality of care, they will deliver over decades of practice following graduation.

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Disclosure statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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