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Post-Carnegie II Curricular Reform: A North American Survey of Emerging Trends and Challenges

by:

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DEDICATION

This thesis is dedicated to my husband, Gary, who, by virtue of his enduring patience and steadfast support during the many months spent working on this manuscript, was truly the 'wind beneath my wings.'

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Arnyce R. Pock
28 April 2019

ABSTRACT

Introduction: In 2010, coincident with the 100th anniversary of Flexner's sentinel report, the Carnegie Foundation published an updated review of North American medical education (Carnegie II) and challenged medical schools to initiate further educational reforms. As we approach the 10-year anniversary of this latest report, we sought to determine what type of curricular revisions have been emerging within the past decade and what types of challenges have North American schools encountered along the way?

Methods: In the Spring of 2018, an electronic survey was disseminated using a publicly available Association of American Medical Colleges database. Free text comments were grouped into themes using the constant-comparative technique. Shared experiences and viewpoints derived from educational leaders in five schools who were among the "early adopters" of a re-positioned Step 1 examination were collected, discussed, and distilled into a concise summary of commonly experienced challenges and strategies. In addition, a manual review of the 160 websites corresponding to Schools of Medicine that were either fully or provisionally accredited by the Liaison Committee on Medical Education (LCME) were reviewed to determine whether a unique curricular name had been assigned to their undergraduate curricula. Results were analyzed and aligned into a series of corresponding themes, using a constant-comparative technique.

Results: 60 unique survey responses were received, yielding a 36.14% response rate. The distribution of responses was proportionally representative of the distribution of public vs. private, old vs. new vs. established North American medical schools. Self-reported curricular changes aggregated into five main themes: Changes in curricular structure/organization, changes in curricular content, changes in

curricular delivery, changes in assessment, and changes involving increased use of technology/informatics.

One of the more 'disruptive' changes involved re-positioning the Step 1 examination, an approach that is being adopted by a small, but steadily increasing number of U.S. medical schools. As educational leaders from five institutions confirmed, re-positioning this exam frequently evokes one or more of six commonly experienced issues, most, if not all, can be successfully overcome with proactive planning and outreach. But whether seeking to re-position the timing of the Step 1 exam or implementing any other form of major curricular revision, overcoming faculty resistance, faculty development, securing adequate resourcing, change management, and competition for limited amounts of curricular time represent commonly experienced challenges.

Another relatively new, but emerging trend, involves the assignment of a unique curricular name to undergraduate programs. At present, 31.5% of the 143 U.S. allopathic schools, but only one (5.8%) of the 17 LCME accredited Canadian medical schools associate a unique curricular name with their educational programs, all of which could be aligned into one of eight over-arching themes.

Discussion: Changes in curricular organization, content, delivery, assessment and the use of technology all reflect reforms that are broad and deep. Empowering faculty to "let go" of familiar constructs/processes requires strong leadership, particularly when initiating particularly disruptive curricular changes, such as relocating the Step 1 examination or shifting to a competency-based curriculum. Major strides have been made, but the vision described by Carnegie II has yet to be achieved.

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CHAPTER 1: INTRODUCTION

Background

One hundred and nine years ago Abraham Flexner published the first of two landmark documents on behalf of the Carnegie Foundation, reviewing the state of medical education in North America and Europe. The first report was released in 1910 and detailed the first-hand observations that Flexner made by visiting each of the 155 U.S. and Canadian medical schools that were in existence during the period of December 1908 and April 1910. In 2010, coincident with the 100th anniversary of this sentinel report, Cooke, O'Brien, and Irby visited a self-selected sampling of 11 U.S. medical schools and 3 academic health systems[1] and published their findings in the form of an updated review of North American undergraduate medical education (UME). The resulting text, titled *"Educating Physicians: A Call for Reform of Medical School and Residency*" (1), a.k.a. "Carnegie II", focused on, and advocated, four key recommendations: 1) The need for standardized outcomes while allowing for individualized processes, 2) the importance of integrating knowledge with meaningful clinical experiences, 3) cultivating habits of inquiry and innovation, and 4) professional identity formation.

As we approach the 10th anniversary of the release of this contemporary review of UME, one must ask, what, if anything, has in fact changed -- not only in North America, but around the globe?

While embarking on a comprehensive, modern-day, Flexnerian review of the 2,600+ medical schools (2) that currently exist around the world would be an extraordinarily challenging task, this thesis used a combination of a formal literature review and empirical research to explore the topic of contemporary curricular innovation and reform.

[1] Northwestern University, Mayo Medical School, Southern Illinois University, University of California, San Francisco, University of Florida, University of Minnesota, University of North Dakota, University of Pennsylvania, University of South Florida, University of Texas—Medical Branch, Galveston, and University of Washington, Atlantic Health, Morristown, New Jersey, Cambridge Hospital, Cambridge, Massachusetts and Henry Ford Hospital and Medical Center, Detroit, Michigan

Within the past ten years, the medical literature has reflected an increased emphasis on an array of methods by which undergraduate medical education can be reformed. Whether in order to more effectively address new and emerging clinical and scientific discoveries or in recognition of the observation that contemporary (millennial) medical students tend to approach learning in a different, and/or seemingly non-traditional manner, medical schools in general and North American medical schools, in particular, are taking measures to adapt and/or re-create their curricula. In some cases, this may simply involve introducing new topics—such as precision medicine, addressing issues of health disparities, and caring for members of special and/or under-served communities. On the other hand, the literature also reflects an increased focus on cultivating way to markedly reduce—or even eliminate, the traditional reliance on lectures in the pre-clinical curriculum, to discussions on the importance of enhanced curricular integration, to delaying the administration of the Step 1 examination, and to the prospective merits of transitioning from time-based to competency-based curricula.

Purpose and Research Questions

The purpose of this thesis is to explore some of the contemporary revisions that have taken place within the realm of undergraduate medical education. More specifically, this thesis seeks to document major curricular changes that might have been initiated consequent to the release of the second (2010) Carnegie Foundation report.

As a result, this research sought to identify answers to three key questions: a) What types of curricular changes have been emerging within the past decade and b) what challenges have been encountered along the way? It also sought c) to determine whether North American medical schools

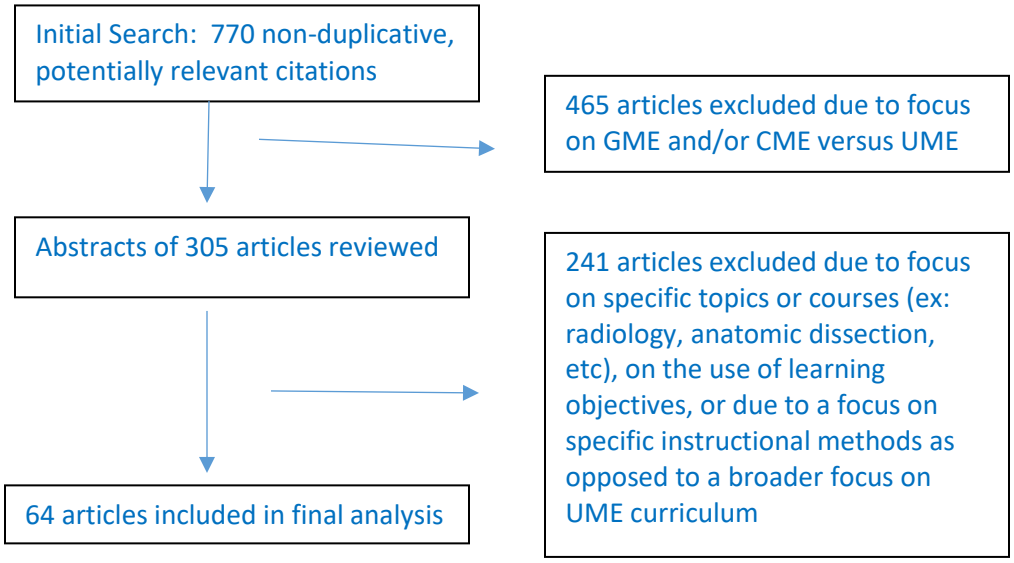
have characterized the nature of their curriculum by adopting the use of a unique curricular name, and if so, are there any common names and/or themes?

Researching and synthesizing answers to these questions could be important as it could provide the foundation for the development of a shared registry of contemporary, UME related, curricular innovations and implementation strategies. Initiating such a database could not only be useful when contemplating modifications to the curriculum currently in use at the Uniformed Services University of the Health Sciences (USUHS), but could allow USUHS to expand its engagement and collaborative opportunities with medical schools across the globe.

Literature Review

An initial literature review focusing on the English language publications during the period of 2007-2017 that were indexed in either the PubMed, Embase, Scopus, or ERIC databases was conducted with the assistance of one of the senior USU Librarians. Various combinations of phrases pertaining to Undergraduate Medical Education, Medical School, Curriculum, Education, Models, Revision or Reform were used to conduct the search. The initial search yielded 1120 records, of which 770 were found to be non-duplicative.

Figure 1: Approach to Literature Review



As depicted in the preceding diagram, the abstracts for each of these records were sorted and reviewed, first eliminating papers that did not specifically pertain to undergraduate medical education, and then by eliminating manuscripts that did not address topics directly pertaining to curricular reform or revision. This led to the identification of a core of 64 articles that were reviewed in greater detail.

Although a number of articles addressed the cardinal aims of the 2010 Carnegie Report—namely the need to strive for a) standardized outcomes with individualized processes, b) better integration of basic, clinical and social sciences, c) the cultivation of habits of inquiry and improvement, and d) professional identity formation (1), only one paper (3) provided a more expansive review. However, that report primarily focused on some of the enduring challenges facing medical education (e.g. the need for generalists vs. specialists, challenges of an over-crowded curriculum, the burgeoning increase in biomedical knowledge, and the need for a greater emphasis on the social sciences), that have

persisted over the past century. Others, such as DiLullo et al (4), addressed the role of technology and the creation of "personal learning environments," that can make teaching millennial students, those born between 1982-2001, more effective and rewarding. Jason & Douglas (5) described emerging efforts to create an International New School of Medicine (iNSoMed) that would serve as a 'test bed' for new initiatives and innovative strategies, although at the time of publication (Feb, 2015), the efforts were just commencing.

A large number of articles reinforced the need for advanced integration of clinical and basic sciences, exemplified by descriptions of the "New Integrated Curriculum," that was implemented at Harvard in 2006 (6). Malone & Supri (7) addressed the advantages/disadvantages of a competency based curriculum, while others such as Wackett et al (8) highlighted the need for individual learning plans and a more intensified preparation for transition to internship and beyond. Other North American articles focused on the benefits of Longitudinal Integrated Clerkships, "flipped" classrooms, and the shift from traditional lectures to small group teaching and problem-based learning (PBL), however even these innovations seem to fall somewhat short when it comes to fully envisioning the sweeping reform of UME proposed by Cooke, O'Brien and Irby.

A review of UME related curricular revisions that have taken place in the international arena—as reflected by a review of articles published in English, highlights many of the same challenges and objectives previously cited in North American literature. While the Bologna Declaration of 1999 emphasized professional and curricular standardization within the European continent, it also led to some curricular revisions in countries such as Switzerland (9) and to some extent in Kosova (10). A similar need for standardization was evident in China, whose Institute for International Medical Education established, in 2004, an eight-year curriculum designed to address a series of "global minimal

essential requirements" (GMER) needed by physicians (11), with the ultimate goal of generating "five-star doctors" (12) capable of being proficient care providers, decision makers, communicators, community leaders and managers.

While the ultimate goals of UME—cultivating the next generation of clinically proficient, humanistic physicians who are able to leverage scientific developments for the benefit of our global community-- appear to be fairly universal, the points of departure and means of arriving at this educational destination appear to be highly variable. This is perhaps aptly portrayed by Qureshi (13), who, writing from Saudi Arabia, envisions the period of 2030-2050 as the "Era of Revolution," marked by the development of a common core of health-related training, that would allow for the differentiation of students into either physicians, allied health workers, or medical scientists, by following a 5-7 year trajectory that would commence immediately upon completion of 12 years of general education.

Whereas the existing literature contains an array of publications related to challenges of 21st century medical education, efforts to identify an existing publication highlighting a cross section of contemporary innovations—leading up to or following the release of the 2nd Carnegie report have been elusive. This is especially true when searching for articles highlighting examples of curricular innovation in the international community of undergraduate medical education.

Each year, the Association of American Medical Colleges (AAMC) publishes a report—the Medical Student Admissions Requirements (MSAR)® (AAMC-MSAR), that includes a summary of medical school mission and/or vision statements, but an article analyzing curricular names/themes does not yet appear to exist. Similarly, the AAMC's Curriculum Inventory (AAMC-CI) contains global data on the number of schools that have engaged in, or are planning curriculum change, but it does not appear to include a discussion of school-specific innovations. Moreover, since AAMC member schools are not

required to populate this on-line repository, the extent and level of detail incorporated into this database seems to vary by institution and may not always be complete and/or fully up-to-date.

In order to ascertain what type of curricular innovations might be taking place within the global community of military-medical schools, a literature search of Embase (using combinations of the terms military, education, curriculum, medical and/or comparative study) and PubMed (key words program development and military medicine/education) was performed with the assistance of Mr. Stephan Spitzer (USU LRC). This review failed to locate any prior English language publications comparing the structure and composition of international military medical school curricula. While USU has published a wide array of materials pertaining to its curriculum, information on other military medical school curricula appears to be limited to published profiles of just a few individual institutions. These are typified by a paper that was published in *Military Medicine* in 2016, (14) highlighting the overall structure of the Israeli Defense Force's new Army Program for Excellence in medicine (APEX), although this is more of a dedicated track for emerging military physicians, than a separate military medical school *per se.* Likewise, a 2009 publication from Thailand (15) highlighted military medical education of cadets enrolled in the Phramongkuklao College of Medicine, but this was limited to a descriptive narrative of a single program. The only truly comparative report that was identified, was a 2002 review of post graduate dental training in programs that were sponsored by either the military or the Department of Veterans Affairs (16).

Theoretical Framework

The over-arching theoretical framework used in development of this project was the research paradigm of social cognitive theory as analyzed by Torre & Durning (17). Although the interpretivisim

framework described by Bunniss & Kelly (18) was initially considered, the social cognitive theory proved to be a more salient framework as it not only incorporated the triadic reciprocity of the personal/cognitive, environmental, and behavioral influences on behavior, but also allows for consideration of cultural influences as well as the interactions that take place within an educational community of practice.

One of the reasons that social cognitive theory was deemed pertinent to this research relates to the combined focus on personal, behavioral, and environmental aspects. From a curricular standpoint, environmental considerations leading to curricular change include the influence of new and emerging technologies, medico-legal considerations, and changes to the frontier in which healthcare is delivered. Environmental considerations have also been noted by Bruner and by Lave and Wenger (19) as having cultural and collaborative elements respectively. In fact, an example of the latter involves the establishment of communities of practice, which can be highly instrumental in effecting and communicating curricular changes among and within academic institutions.

Personal factors—such as how students respond to curricular material and the associated cognitive load are also integral aspects of social cognitive theory, particularly when applied to the realm of curricular reform. Finally, behavioral influences—which not only take into consideration how students respond/react to certain teaching methodologies, but also consider that schools can learn from the collective experiences and observations shared by other schools, makes this a salient framework for this type of research.

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CHAPTER 2: POST-CARNEGIE II CURRICULAR REFORM: A NORTH AMERICAN SURVEY OF EMERGING TRENDS & CHALLENGES

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ABSTRACT

Introduction: In 2010, coincident with the 100th anniversary of Flexner's sentinel report, the Carnegie Foundation published an updated review of North American medical education and challenged medical schools to initiate further educational reforms. As we approach the 10-year anniversary of this latest report, we sought to determine what type of curricular revisions have been emerging within the past decade and what types of challenges have they encountered along the way?

Methods: In 2018, an electronic survey was disseminated using a publicly available Association of American Medical Colleges database. Free text comments were grouped into themes using the constant-comparative technique.

Results: 60 unique responses yielding a 36.14% response rate. The distribution of responses was proportionally representative of the distribution of public vs. private, old vs. new vs. established North American medical schools. Self-reported curricular changes aggregated into five main themes: Changes in curricular structure/organization, changes in curricular content, changes in curricular delivery, changes in assessment, and changes involving increased use of technology/informatics. Challenges

were predominantly focused on overcoming faculty resistance, faculty development, securing adequate resourcing, change management, and competition for limited amounts of curricular time.

Discussion: Changes in curricular organization, content, delivery, assessment and the use of technology reflect reforms that are broad and deep. Empowering faculty to "let go" of familiar constructs/processes requires strong leadership, particularly when initiating particularly disruptive curricular changes, such as relocating the Step 1 examination or shifting to a competency-based curriculum. Major strides have been made, but the vision described by Carnegie II has yet to be achieved.

Introduction

One hundred and nine years ago Abraham Flexner published the first of two landmark documents on behalf of the Carnegie Foundation, reviewing the state of medical education in North America and Europe. The first report was released in 1910 and detailed the first-hand observations that Flexner made by visiting each of the 155 U.S. and Canadian medical schools that were in existence during the period of December 1908 and April 1910. In 2010, coincident with the 100th anniversary of this sentinel report, Cooke, O'Brien, and Irby visited a self-selected sampling of 11 U.S. medical schools and 3 academic health systems and published their findings in the form of an updated review of North American undergraduate medical education (UME). The resulting text, titled *"Educating Physicians: A Call for Reform of Medical School and Residency*" (1) a.k.a. "Carnegie II", focused on, and advocated, four key recommendations: 1) the need for standardized outcomes while allowing for individualized processes, 2) the importance of integrating knowledge with meaningful clinical experiences, 3) cultivating habits of inquiry and innovation, and 4) professional identity formation.

Since embarking on a full-fledged Flexnerian-type review of the 169 North American medical schools that are currently in existence, would be a challenging task, a modified approach, using an electronic survey, was utilized in the present study, to explore emerging trends and challenges associated with curricular revision in undergraduate medical education. As we approach the 10th anniversary of the release of Cooke & Irby's review of UME, we sought to determine what type of curricular changes have been emerging within the past decade? And what challenges have they encountered along the way?

Theoretical Framework

Social cognitive theory as articulated by Torre & Durning (2) served as the theoretical framework for this work. This framework was chosen as it not only incorporated the triadic reciprocity of the personal/cognitive, environmental, and behavioral influences on behavior, but also allows for the consideration of cultural influences as well as the interactions that take place within an educational community of practice.

From a curricular standpoint, environmental considerations leading to curricular change include the influence of new and emerging technologies, medico-legal considerations, and most importantly, changes to the frontier in which healthcare is delivered. Environmental considerations have also been noted by Bruner (3) and by Lave and Wenger (4,5) as having cultural and collaborative elements respectively. In fact, an example of the latter involves the establishment of communities of practice, which can be highly instrumental in effecting and communicating curricular changes among and within academic institutions.

Personal factors—such as how students respond to curricular material and the associated cognitive load are also integral aspects of social cognitive theory, particularly when applied to the realm of curricular reform. Finally, behavioral influences—which not only take into consideration how students respond/react to certain teaching methodologies, but also consider that schools can learn from the collective experiences and observations shared by other schools, makes this a salient framework for this type of research.

Methods

Consistent with best practices in survey design, a literature review was conducted. The results (Chapter 1) were the first step in the construction and revision of the survey.

Survey Methodology

In the Fall of 2018, an electronic survey was developed and distributed to representatives of all Liaison Committee on Medical Education (LCME) accredited North American medical schools. The survey instrument was disseminated electronically for purposes of efficiency, and to facilitate a comparable analysis, by eliciting curricular feedback at a designated point in time. The instrument sought to identify what and where some of the self-identified curricular innovations were occurring, what challenges might have been encountered, and to determine how many schools have transitioned away from a traditional, 2x2 (24 month predominantly basic science oriented + 24 months of primarily clinically oriented) curriculum, to a more integrated, organ-system type approach.

The survey was developed independently by the primary author (AP) and was further refined following a focused review with three colleagues representing different facets of academic medicine. One was a PhD with specific expertise in survey methodology, one was an academically oriented physician, and the third was a mid-level administrator. Additionally, two structured, face-to-face, cognitive interviews—one involving a physician colleague, and one involving a non-physician staff member, were then used to further refine the survey instrument (Appendix). The completed survey was subsequently reviewed by the Uniformed Services University of the Health Sciences (USU) Institutional Review Board (IRB) which determined that the protocol was IRB exempt.

The finalized survey was distributed via an electronic survey platform (Qualtrics; https://www.qualtrics.com), during the period from 6 August -10 September 2018. The survey was sent to each of the individuals who were listed as being institutional points of contact in the Association of American Medical Colleges' (AAMC) publicly available database (May 2018 edition) of educational deans. In most cases, the designated individuals were Associate Deans of Medical Education or

Associate Deans for Curriculum, but in some instances the Dean of Academic Affairs or Vice Dean were listed. Approximately five days prior to the sending of the first survey, an introductory message was sent via email to each of the prospective respondents, alerting them to the upcoming arrival of the survey.

The surveys were subsequently disseminated at T=0, and to non-respondents, at T=1, 2, 3 and 4 weeks. Survey responses were tracked and acknowledged on a weekly basis, with a brief thank-you e-mail being sent to those who responded to the survey request in full or in part. In an effort to enhance the response rate, schools for which an initial response was not received at the end of the first full week received additional, modified reminder messages on a weekly basis, for up to four weeks. The absence of a reply after the 4th attempt was recorded as a negative reply.

The survey was comprised of forced-choice responses and free text items. Forced choice items were collated and reported in a standard manner. All of the free-text replies were initially reviewed by the primary author (AP) who conducted an independent analysis, aligning the responses into provisional themes in accordance with the constant-comparative technique. This preliminary categorization was independently reviewed and refined by a three-person subgroup (SD, LP, WG); all investigators (AP, SD, LP, WG) reviewed the final coding to ensure thematic accuracy and consensus.

Results

The overall response rate was 36.14%, representing responses from 60 of 166 medical schools. Free text responses were reviewed and coded by the authors into three general categories: respondent demographics, curricular changes/innovations, and challenges encountered when undertaking a significant curricular revision. Within the curricular innovations and challenges categories, the authors

grouped findings into themes. Thematic saturation was reached after 88% of the responses were reviewed.

Respondent demographics:

61 survey responses were received, with one duplicate entry, leaving a net response of 60 participants. Using a denominator of 166, which reflected the total number of U.S. (N=149) and Canadian (N=17) medical schools that had been granted full (N=141), preliminary (N=6), or provisional (N=2) accreditation by the LCME (6) by the start of calendar year 2018, the overall response rate was 36.14%.

Of the 60 unique responses, seven respondents did not include a school affiliation, inserting a "N/A" annotation in response to this question. There were also two respondents from schools in Puerto Rico and two from Canadian medical schools.

Using the US Census Bureau's definition of geographic regions (7) survey responses were received from 9 of the 34 (26.5%) LCME accredited medical schools located in the Northeastern U.S. Twelve of 34 (35.3%) Midwestern schools replied, as did 24 of the 54 schools (44.4%) located in the Southern U.S. While 50% (2 of 4) Puerto Rican schools submitted survey responses, only 3 of the 21 (14.3%) of schools in the Western U.S. responded, as did only 2 of the 17 (11.8%) of Canadian medical schools accredited by the LCME. A summary of respondents—indicating geographical region, duration of LCME accreditation, and type of school (public vs. private) is reflected in Appendix 4. (6, 8)

When considering the representation of public versus private institutions in the survey response, survey representation was nearly equivalent with that of the U.S overall, with 62% of survey respondents emanating from public institutions and 38% from private institutions. This is consistent with national statistics (8) that indicate that 63% of the allopathic schools located within the United States are public institutions, with 37% being privately sponsored.

Finally, using the year of initial LCME accreditation as a comparison, the number of respondents from relatively new, old, or established medical schools was also found to be proportionally representative of the overall distribution within North America. (Appendix 5).

Curriculum Based Demographics

One of the foundational questions in the survey asked "Does your school have a standard, pre-clinical, basic science curriculum? In other words, are students required to complete a period of study focused on the basic sciences—anatomy, physiology, pathology, microbiology, immunology, etc., before starting their full-time rotations?" While the majority (83.3%) of the 54 respondents replied in the affirmative, 9 (16.6%) replied "no". An investigative review (Appendix 6) of the pre-clinical curricular descriptions included on these school's websites revealed an increased emphasis on advanced forms of curricular integration, the use of longitudinal threads, early and substantive clinical immersions, and/or blended learning techniques. Moreover, several of these schools are not only integrating clinical and basic sciences in the pre-clinical curriculum but are actively incorporating elements such as health systems science along with the arts and humanities, into students' early educational experiences as well.

Of the 45 schools that indicated that they do offer a standard, basic-science oriented, pre-clerkship curriculum, the typical duration was 18 months, however one school reported use of a 13-month pre-clerkship curriculum, with 6 continuing to utilize a traditional 24-month pre-clerkship curriculum. The survey also sought to determine how schools tended to organize their pre-clerkship curricula—i.e. continuing to maintain a departmentally focused approach, an organ-systems type approach, or a review of normal followed by abnormal development/disease states. While some schools may be using a combination of two or more of these organizational approaches, the most commonly

cited response involved use of an organ-system based approach to the pre-clerkship curriculum, with departmentally/disciplined focused presentations and/or review of normal followed by abnormal disease states comprising smaller proportions.

Curricular Changes/Innovations

One of the key components of this survey involved identifying the "three most significant curricular changes" that schools had undertaken within the past ten years, and whether they were implemented as part of an overall curricular revision. The final categorization, following the constant-comparative technique, is reflected in Table 1 (below) and represents the consensus of all four investigators (AP, SD, LP, WG). The same approach was used in categorizing the representative examples of curricular revisions summarized in Table 2.

Table 1: Types of Self-Reported Curricular Changes/Innovations

SELF-REPORTED CURRICULAR CHANGES/INNOVATIONS (Themes represented by bold type)	Total No. of Responses (N=122)
Changes to Curricular Structure/Organization: --Structural/Organizational Changes (N=16) --Three Year Medical School Track (N=1) --Shortened Pre-Clerkship Curriculum (N=5) --Re-Alignment of USMLE Step 1 Exam (N=3) --Increasing Opportunity for Electives in MS-3 Year (N=2) --Resurrecting "Old" Structures/Formats (N=1)	28 (22.9%)
Changes to Curricular Content: --Incorporating New or Expanded Forms of Curricular Content (N=10) --Early Clinical Exposures (N=7) --Establishing Longitudinal Experiences (N=7) --Reinforcing Basic Science in the Clinical Years (N=3) --Promoting Student Research/Scholarship (N=6) --Emphasis on Quality and Patient Safety (N=2) --Expanded Health & Wellness Initiatives (N=2)	37 (30.3%)

Changes to Curricular Delivery: --Fostering Enhanced Curricular Integration (N=19) --Increasing Emphasis on Active Learning/Decreased Reliance on Traditional Lectures (N=14) --Emphasis on PBL or TBL (N=6) --Pre-Clerkship "Boot Camp" (N=2)	41 (33.6%)
Changes to Assessment: --Developing a Competency Based Assessment/Curriculum (N=7) --Incorporating New/Altered Forms of Assessment/Assessment Tracking (N=3) --Elimination of Traditional (Letter) Grades (N=3)	13 (10.6%)
Increasing Use of Technology & Informatics: --Curriculum Mapping (N=2) --Enhanced Use of New/Emerging Technology (N=1)	3 (2.5%)

A range of curricular innovations were cited by survey respondents. While all are noteworthy, the investigators believed that some of the more unique examples included the incorporation of Lean Six Sigma Yellow Belt training for all medical students (Cooper Medical School), offering students the option of completing a Master of Science in Population Health as part of a pre-selected, primary care oriented, curricular track (Warren Alpert School of Medicine), facilitating scholarly opportunities in the emerging fields of Medical Design, Health Policy, and Digital Health (Sidney Kimmel Medical College), as well as providing instruction in areas pertaining to Health Justice and Business Leadership and Patient Safety (Georgetown University).

Table 2: Examples of Recently Implemented, Self-Reported Curricular Innovations

TYPES OF CURRICULAR CHANGE/INNOVATION (Representative examples with participant quotes in italics; themes in bold type)	**NUMBER (N=122) AND PERCENT RESPONDENTS CITING SIMILAR CHANGE(S)**
Fostering/Enhancing Curricular Integration --Incorporating and developing distinct curricular threads (e.g. Lifestyle Medicine, Medical Decision-Making & Laboratory Medicine, Health Equity &	19 (15.6%)

Advocacy, Teamwork & Leadership, Healthcare Quality & Patient Safety) (Northwestern Univ) -- *"Alignment of histology, pathology, cell biology/biochemistry with the sequence of dissections in the anatomy course. Significant to help students integrate understanding of the inter-relatedness of these disciplines…."* --"*Integrated curriculum based on 90 'Chief Complaints and Concerns.'"* --*"We are a new school…deliberately adopted an innovative curriculum that is highly integrated and clinical presentation-based (in systems-based units with each week's content is derived from what a clinician would need to know, understand and apply in order to diagnose a patient with a highly relevant and motivating common clinical presentation.)" ….The instructional week is based on the Kolb learning cycle, starting with motivating context (a common clinical presentation and introductory diagnostic scheme), followed by integrated instruction in relevant new material, followed by opportunities for deliberate practice (related medical skills instruction and formative assessment), followed by application in case-based small group sessions in which students apply their new knowledge in the context of the week's clinical presentation and diagnostic scheme."*	
Organizational Changes (to include shortened pre-clerkship period) -- Created a 4-Pillar Framework: Medical Science, Clinical Science, Health Systems Science, Health Humanities -- *Obliterating discipline, organ system and departmentally focused course work (and normal/abnormal organization) to form large, integrated thematic blocks that require faculty from multiple disciplines from across the basic science and clinical science spectrum to work together…."* --Adopting an organ-system model (vs discipline-based) approach; --"*C21 provides a myriad of pathways for students to choose from (3, 4, 5 years and MSTP)."* -- Courses based on "*themes rather than departments"* -- *"Creation of semester-long, very large (20 credit) interdisciplinary courses….no courses are departmentally owned…all run by the office of med ed, however the funding structure of the school has not changed, and that can be problematic."*	16 (13.1%)
Emphasis on Active Learning/Decreased Reliance Traditional Lectures -- Asynchronous lecture delivery (UC Davis) -- Marked increase active learning; minimum 50% active learning throughout pre-clerkship curriculum; -- Use of "flipped" classroom activities -- Expanded use of Problem Based Learning/Case Inquiry type sessions; --"Lecture free curriculum" (as of July 2017)	14 (11.5%)
Expanded Coverage of Contemporary Topics/Skills -- Medical Spanish (formal instruction as part of pre-clerkship curriculum) -- Pain Management -- Palliative Care	10 (8.2%)

-- Social Determinants of Health -- Health Systems Science (specifically cited in 4/10 schools) -- Course on Public Health and Health Systems --Population Health (specifically cited in 4/10 schools) ---"*Development of a primary care-population medicine program from up to 24 students each year, in which these students will graduate with a medical degree as well as a Master of Science of Population Medicine—a Masters program that is currently offered nowhere else in the world. This is for students whom we expect to become national leaders in academic primary care." (Warren Alpert School of Medicine, Brown University);* -- Course on Cultural Competency -- Course on Translational Research -- Professional Development course --- Curra Personalis Curriculum (Georgetown University School of Medicine); 1-year fellowship for up to 10 medical students; followed by opportunity to participate in longitudinal developmental activities in years 2-4. See also: **https://som.georgetown.edu/CuraFellowship#**	
Enhancing/Emphasizing Early Clinical Exposures -- Having students work with community agencies…means of promoting service as well as inter-professional education; --*"Students start seeing patients [by] week 2 of medical school."*	7 (5.7%)
Establishing Longitudinal Experiences -- Adopting a Hybrid, Traditional Block + Longitudinal Integrated Clerkship Model (Cooper Medical School) -- Four Year "*integrated public health and the practice of medicine curriculum*" –includes 1- public health/practice of medicine domains, including health disparities, medical economics, occupational & environmental health, etc.) -- Longitudinal Primary Care Component included in Primary Care Clerkship -- Longitudinal Integrated clerkship for students in primary care-population medicine program -- Thematically organized, expanded, 12-week clerkship blocks (ex: The Medical Approach to the Patient—medicine & neurology; The Surgical Approach to the Patient—surgery & emergency medicine; Women's & Children's Health (OB-GYN & pediatrics); Biopsychosocial Approach to Health (primary care & psychiatry); --*"Longitudinal courses in ultrasound (4 years), ethics, population health, system health, medical decision making."*	7 (5.7%)
Promoting Student Research/Scholarship -- Incorporating a Capstone Course/Research Opportunity and/or Area of Scholarly Concentration extending throughout all four years of medical school; --*"Introduction of 16-week mentored research experience culminated with an MD thesis for ALL students."*	6 (4.9%)

--*Scholarly inquiry requirement for all students with 8 tracks including Design, Med Ed, Digital Health, Humanities and Healthcare systems among others." (Sidney Kimmel Medical College; **https://www.jefferson.edu/university/skmc/programs/scholarly-inquiry/overview.html**)* --*"Journey(s) curriculum created space for individual student passions and faculty innovations. It uses intersessions with choice of pertinent short pertinent topical faculty driven subjects. Individual journeys periods… [allow for] pursuit [of] one of five scholarly concentrations (Health Justice, Population Health & Prevention, Medical Humanities, Medical Education Research, Business Leadership and Patient Safety). Also has room for better development ... [of]…Individual Scholarly Project." (Georgetown University School of Medicine)*	
Emphasis on Problem and/or Team Based Learning -- Using small groups of students	6 (4.9%)
Shortened Pre-Clinical Curriculum	5 (4.1%)
Eliminated Traditional (Letter) Grades --Pass-Fail Pre-Clerkship Curriculum	3 (2.5%)
Reinforcing Basic Science in Clinical Years -- "Return to deep dives in Basic Science after early clinical entry" (Georgetown University School of Medicine)	3 (2.5%)
Re-alignment of USMLE Step 1 Examination	3 (2.5%)
Optimized Assessments/Assessment Tracking -- JustInTimeMedicine Software for dashboarding of all assessment data --"*Introduced an arc of high-fidelity clinical skills assessment*" -- "*Longitudinal progress tests of clinical reasoning*"	3 (2.5%)
Curriculum Mapping --*"Standardization of pre-clerkship curriculum to standardized examination content outline and linkage of all materials (lecture objectives, quiz and exam questions, etc.) to this blueprint."*	2 (1.6%)
Emphasis on Quality and Patient Safety -- Lean Six Sigma Yellow Belt training for all M1 students (Cooper Medical School, Rowan Univ. NJ)	2 (1.6%)
Pre-Clerkship "Boot Camp"	2 (1.6%)
Expanded Health & Wellness Initiatives --*"We launched a health and wellness initiative integrating nutrition, exercise, and mindfulness training into our curriculum"*	2 (1.6%)
Increasing Opportunity for Electives in MS-3 Year	2 (1.6%)

--"*Allow students to take electives during their clerkship year…. Giving students exposure to fields they would not ordinarily have exposure to with conventional clerkships."*	
Three Year Medical School Track -- Accelerated Competency Based Education for students interested in Primary Care (UC Davis)	1 (0.8%)
Resurrecting "Old" Structures/Formats -- Returned to stand-alone M1 Anatomy course; "*students were not mastering anatomy content" when integrated during the first two years of the curriculum;*	1 (0.8%)
Technology Related -- Issuing iPads to all students; "*curriculum is delivered to the iPads and pedagogies such as flipped curriculum utilizing i-book, interactive videos, and team-based learning are being utilized."*	1 (0.8%)

Challenges Encountered

In contrast to the wide array of self-identified curricular revisions, responses to the question "What were the most significant challenges that you or your program encountered when contemplating any of these changes" revealed a smaller number of themes. These were reviewed, sorted, and aligned into eight over-arching categories using the constant-comparative approach with discussion and refinement by all four investigators. Their consensus is reflected in Table 3. While a large proportion of comments pertained to faculty resistance to change ("*much rested on faculty identity with their discipline-based courses"),* issues of faculty development, resourcing, and overall change management were also sources of significant challenge. Of particular note is that resistance to change was not limited to faculty, as student resistance to change ("*this is not the program I was admitted into")* could also be a formidable factor.

Table 3: Significant Challenges Encountered when Contemplating Curricular Changes

TYPES OF CHALLENGES ENCOUNTERED (Representative quotes in italics)	**NUMBER and PERCENT of TOTAL RESPONDENTS (N=55) CITING SIMILAR CHALLENGES**
Faculty Resistance to Change -- *"Faculty reluctance to change. Much rested on faculty identity with their discipline-based courses."* --*"Frustration of faculty with 'new generation learners"* --*"Faculty resistance to reducing pre-clinical time"* --*"…recently completed an LCME review that resulted in a perfect score. Within this context it was challenging to convince some faculty of the need for change."* --*"Getting faculty on board, fear of change, fear of loss. It took a lot of consensus building, process, and listening."* --*"The insecurity/fears of the basic science departments about losing control of courses"* --*"Reluctance by anatomy faculty to move to integrated systems courses, including anatomy, rather than the stand-alone course they had for many years!"* --*"Fear by basic scientists that they would be marginalized"* --*"Faculty resistance to losing course control (basic science faculty) when we integrated clinical and basic science"* --*"Faculty buy-in and resistance to change"* --*"The biggest challenge was getting Basic Science faculty to accept the shortened science curriculum. In the first year, it seemed like they tried to sabotage the curricular change at every turn."*	17 (30.9%)
Faculty Development/Competing Faculty Demands/Limited Faculty Time -- "*Competing other faculty demands (clinical work, research, other educational roles) that may reduce the time faculty have to develop new content or implement new teaching methods."* --*"Faculty preparedness and availability continues to be the most difficult challenge to overcome. Most basic science faculty are unable or unwilling to contribute to the clinically-relevant learning experiences and clinical faculty are time-constrained, being expected to earn the clinical income that keeps the whole enterprise going."* --*"There has been insufficient attention to teacher and educational leader development"*	9 (16.4%)
Financial Considerations/Resources --*"Money—primarily compensation for clinical involvement. Clinical capacity."* --*"Getting enough time for our faculty to be small group facilitators"* --*"Availability of clinical faculty for pre-clinical teaching"* --*"Money!!"*	9 (16.4%)

--*"Resources—recruiting hundreds of community-based physicians to serve as preceptors in our curriculum."*	
Overall Resistance to Change --*"General resistance to change"* --*"Change is hard"* --*"Change management. Loss of familiar courses/structures."* --*"The most significant challenge is change itself, in the eyes of students and faculty. This has been especially true as incorporated Health Systems Science into the curriculum. Students appreciate its importance in the big picture but not in the short term when Step 1 is what matters."* --*"The curriculum revision required a change in culture so that Departments no longer managed the curriculum...."* --*"Reframing student and faculty expectations as we transitioned to primarily student directed small group learning. (Will the students learn enough and the right things? How will they do on national exams? Don't they need a faculty to tell them the 'right' answer and exactly what they need to know?)*	6 (10.9%)
Technology Related --*"Technological challenges—software that doesn't interface well, glitches, or that takes some time to learn or use."* --*"Software to accomplish dashboarding and curricular organization"* --*"…scheduling problems that caused much angst with the students…."* --*"There has been insufficient planning for IT infrastructure needs to support the upcoming changes."*	5 (9.1%)
Regulatory and/or USMLE Step 1 Related Considerations --*"Increased emphasis on the importance of USMLE exams…with the common result of a 'parallel curriculum' emerging that uses commercially available board-prep material and competes for student time."*	4 (7.3%)
Competition for Limited Amount of Curricular Time --*"Limited time in the schedule coupled with increasing content students are expected to master"* --*"Compression of time/schedule in which to teach the same content."* --*"Finding time for the additional curriculum. When something is added something must be cut."*	3 (5.5%)
Student Resistance to Change --*"This is not the program I was admitted into"* --*"How do you keep the current students engaged and enthusiastic about their 'old' curriculum while trying to get faculty and staff excited about a new curriculum? The messaging is very challenging here."*	2 (3.6%)

Despite the inherent challenges, enhancing students' educational experience was the most common basis for implementing curricular revision, and as one respondent noted, ensuring that it

"meet[s] the needs of physicians in the 21st century." Other commonly cited factors supporting curricular revision were a need to fulfill LCME related requirements, increasing student involvement in active and/or self-directed learning, addressing new or emerging curricular or societal needs, expanding opportunities for inter-professional and team-based education, and adopting new and advanced pedagogies. Or, as one respondent wrote "*our motto is 'if it ain't broke make it better'…so we are constantly improving our curriculum in line with advanced in adult learning and medical education."*

Discussion

We conducted an electronic survey to explore emerging trends and challenges associated with curricular revision in undergraduate medical education. The survey included free text responses that we analyzed using the constant-comparative technique. While our survey response rate was suboptimal, we reached thematic saturation and consensus on thematic coding to address these emerging themes and challenges.

Emerging Trends

Considering all the curricular changes that responding schools have implemented, relocation of the USMLE Step 1 examination to after the core clerkships was certainly one of the more substantive and/or controversial changes, second only to the move towards competency (versus time based) progression and completion of undergraduate medical education. While administering a delayed Step 1 exam is still a relatively new phenomenon, there appears to be a small, but steady escalation of the number of schools (N=18) that are now opting for this approach. (9)

Another emerging trend relates to the use of competency *versus* time-based curricular programs. One of the key advantages of shifting to a competency-based curriculum is that it allows students to progress in a more tailored and/or accelerated fashion—consistent with the 2010 Carnegie report that advocated for standardized outcomes but with individualized processes. On the other hand, doing so presumes that interim assessments predict future performance. Malone and Supri (10) also expressed concern that competency-based curricula run the risk of "teaching to the test," and promoting a more "task based" orientation—as opposed to fostering intellectual curiosity and scientific exploration. There is also the potential for even more detailed administrative and documentary requirements—which could further diminish the amount of time faculty can devote to clinical care and in-person teaching. Competency-based education clearly has its merits, but whether it is truly reflective of the next "wave" of curricular revisions remains to be seen.

A number of schools are revising their approaches to undergraduate medical education by incorporating instruction relating to new and evolving contemporary topics (e.g. social justice, digital health, Lean Six Sigma training). There also seems to be an expanding emphasis on helping students cultivate skills associated with the business side of medicine, and on deliberately developing medical students to assume the mantle of physician leadership. The emphasis on the business of medicine is manifest by the increase of dual MD/MBA programs from six in 1993, to over 60 in 2018. (11) The focus on leadership and entrepreneurship is exemplified by the University of Texas at Austin's Dell Medical School which aims to cultivate a "new breed" of physician leaders/influencers. In fact, students at Dell are not only afforded a full nine months to engage in a "Innovation, Leadership and Discovery" block, but are actively encouraged to engage in areas ranging from re-designing and innovating health care to becoming a "student entrepreneur in residence." (12) Yet another example is that of Carle Illinois College of

Medicine, a school that was specifically established to foster the development of a new cadre of physician-leaders—those who are "trained in medicine through the lens of engineering" (13), and who can actively embrace the growing interface between science, technology and medicine. Whether these modified curricula succeed in fully addressing contemporary societal needs and expectations is a question for future research.

Other notable trends include a growing emphasis on enhancing curricular integration, promoting and sustaining a life-long commitment to self-directed scholarship, creating opportunities for early, meaningful clinical exposures (a.k.a. legitimate peripheral participation) and longitudinal clinical experiences. These too, are significant, as they directly support the key tenets outlined in the most recent Carnegie report.

Identifying and Overcoming Challenges

Whether "letting go" involves de-constructing the familiar structure of a long-standing, course-based curriculum, or eliminating reliance on the traditionally delivered, 50-minute lecture, the challenges of implementing truly revolutionary curricular change are often underestimated.
In fact, one of the recurrent themes of this research involved consideration of the many obstacles that can impede the implementation of curricular reform in particular and change management in general.

When it comes to curricular revision, faculty engagement and support can be a force multiplier or a force divider. This was exemplified by the prominent reference to "faculty" when survey respondents were asked to identify the most significant challenge(s) that were encountered when contemplating curricular change. On the other hand, academic change can often be facilitated if the associated leadership team recognizes that while change is an event, transition—to a new curriculum or other major

innovation, is a process. The process of implementing and managing a major transition was aptly described by William Bridges, a scholar of organizational change, who noted that

> "The starting point for transition is not the outcome, but the ending that you will have to make to leave the old situation [curriculum] behind…[the] psychological transition depends on letting go of the old reality and the old identity you had before the change took place. Nothing so undermines organizational change as the failure to think through who will have to let go of what when the change occurs." (14)

Social cognitive theory proved to be an apt framework for evaluating survey results. This was particularly manifest when considering the types of challenges conveyed by respondents when implementing curricular revisions, many of which reflected cultural, environmental, behavioral, and/or personal/cognitive influences. As one respondent stated, "*…the office of med ed is responsible for successful courses…[it] cannot 'hire and fire' faculty as departmentally 'owned' faculty still teach all of the courses."* This statement further highlights the crucial under-pinning of any successful curricular revision: the need to seek, attain, and facilitate the active "buy-in" of the community of students, faculty and other key stakeholders. In fact, when it comes to change management overall, author Jim Collins perhaps said it best when he noted that:

> *"Leaders of companies that go from good to great start not with 'where' but with 'who.' They start by getting the right people on the bus, the wrong people off the bus, and the right people in the right seats. And they stick with that discipline—first the <u>people</u>, then the direction—no matter how dire the circumstances." (15)*

There are two key themes that readers of this paper and/or future Deans might find beneficial when designing and/or modifying future medical school curricula. First, as John F. Kennedy once said, "C*hange is the law of life. And those who look only to the past or present are certain to miss the future*." (16) This is particularly significant, for while change management can be a challenging—and daunting prospect, the potential rewards can be immeasurably positive. Second, while the more recent Carnegie Foundation report includes some salient "calls for action," it should be noted that it concentrated on four specific processes and was based on a relatively focused survey of contemporary medical schools. So, while these avenues for action should still be heeded, they should not distract nor preclude schools from continuing to innovate, and from ensuring that emerging curricula are responsive to the challenges and health needs of an increasingly diverse global society. As such, embracing opportunities to expand the boundaries of early inter-disciplinary and inter-professional curricular integration, and continuing to evaluate the efficacy of competency driven education should be viewed as pivotal foundations for future success.

Limitations

The primary limitation of this study pertains to an overall response rate of 36.14% and the potential for non-response bias. There did, however, appear to be proportional representation with regard to the presence of full or provisional LCME accreditation, status as an "old," "new" or "established" medical school, and status as a private versus public institution. These finding collectively suggest that these results may still be representative of other schools in the North American hemisphere.

Additional efforts to reduce non-response bias were undertaken in accordance with the work of Phillips et al. (17) In particular, a review of the Qualtrics captured time/date free-text entries for early

versus late respondents suggested no difference in responses. Additionally, thematic saturation was achieved after approximately 88% of the responses were received.

Since it was not always apparent as to who was completing the survey, there may have also been some variability depending on individual respondents' fund of institutional knowledge, their experience with, and/or knowledge of curricular changes at their school. Although difficult to definitively ascertain, an inherent selection bias may also have been present, as some respondents may have simply been more or less inclined to participate in the survey for personal, professional, or other reasons. It is also possible that individual responses may have been subject to an interpretive bias, as the submitted replies may have been more reflective of how respondents *perceived* curricular revisions within their respective institutions. Stated another way, what academic leaders' *think* they are doing may not always equate to actual actions and/or effects. In this regard, the ability to visit each of the responding institutions and conduct an on-site validation—akin to the manner in which Abraham Flexner conducted his initial review, would have been helpful in ameliorating this limitation.

Conclusions

While the 2010 Carnegie report highlighted several key areas for educational enhancement and reform, it is evident that nearly ten years later, definite progress has been made, but there is still much to be done. And, while the "wheels" of curricular change may be slow to move, the willingness to explore alternative delivery systems and change our thinking about what is indeed the best approach for developing the next generation of physicians, is the first step in changing the process of medical education for generations to come.

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CHAPTER 3: CHALLENGES ASSOCIATED WITH DELAYING ADMINISTRATION OF THE UNITED STATES MEDICAL LICENSING EXAMINATION (USMLE) STEP 1 TO AFTER THE CORE CLERKSHIPS AND HOW TO APPROACH THEM

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Abstract

An increasing number of medical schools have moved away from traditional 2 + 2 curricular structures, toward curricula that intentionally integrate basic, clinical and health systems science with the goal of graduating physicians who consistently apply their foundational knowledge to clinical practice to improve the care of patients and populations. These curricular reforms often include a shortened pre-clerkship phase with earlier introduction of learners into clinical environments. This has led schools to reconsider the optimal timing of USMLE Step 1. Several schools have shifted the exam to the period immediately after core clerkships. While this shift can provide pedagogical advantages, there are potential challenges that need to be anticipated and proactively addressed. As more institutions consider making this change, key educational leaders from five schools that repositioned Step 1 after core clerkships share their strategies for mitigating some of the potential challenges associated with this approach. The authors describe the following possible challenges: 1) lack of readiness without consolidation of basic science knowledge prior to clerkships, 2) the risk that weaker students will not be

identified and provided academic support early, 3) clerkship or clinical subject (shelf) exam performance weaknesses, 4) extension of Step 1 study time, 5) an increase in student anxiety about residency specialty choices, and 6) a reduced time frame to take and pass board exams. These potential challenges may be addressed using three main strategies: effective communication with all stakeholders, curricular design and assessments that facilitate integration of basic and clinical sciences, and proactive student coaching and advising.

Introduction

Historically students take the United States Medical Licensing Examination (USMLE) Step 1 before starting the clerkships. An increasing number of medical schools have changed the timing of the USMLE Step 1 exam to the period immediately after the core clerkships (Appendix 7). This change is typically made in association with other curricular and assessment revisions that include shortening the pre-clerkship phase and the deliberate integration of clinical, basic and health system sciences from day one of medical school (1) .

In two prior papers, we detailed our reasons for repositioning Step 1. In brief, we aim to 1) foster the integration of the basic and clinical sciences, in part by leveraging a major national assessment to drive study behaviors during clerkships; 2) prepare learners for the increasingly clinical focus of Step 1; 3) facilitate earlier entry into clinical environments; and 4) allow room for other curricular innovations in the pre-clerkship time period to support the triple aim (improving the patient experience, improving the health of populations and lowering the cost of care) (1,2). When altering the timing of Step 1, our schools all significantly shortened our pre-clerkship curricula, added more health systems science content and transitioned to more integrated organ system blocks following the strategic priorities set out in recent major medical education reports. (3,4) The details of these curricular and assessment changes can be found in the associated Appendix.

A recent study demonstrated small but statistically significant increases in Step 1 scores (an average of 2.78 scaled score points after accounting for rising national Step 1 scores) and decreased first-time failure rates (a 2.48% reduction) when Step 1 was positioned after core clerkships (2). This study provides early evidence that changing the timing of the USMLE Step 1 does not negatively impact

student USMLE scores and suggests there may be other desired outcomes. We previously argued that altering the timing of Step 1 may provide certain pedagogical advantages (1), however, there are also some potential challenges and unintended consequences that need to be anticipated and proactively addressed.

Methods

In this paper, we (key educational leaders from five schools that have repositioned Step 1 after the core clerkships) share our experience and strategies for mitigating six challenges associated with this shift. These include: 1) student preparedness for the clerkships—particularly without the Step 1 mediated consolidation and review of the basic sciences, 2) the risk that weaker students will not be identified and provided with early, interventional academic support, 3) risk of decreased performance on clerkship or clinical subject exams, 4) extension of Step 1 study time, 5) the potential for increased student anxiety about residency choices and opportunities, and 6) a reduced time frame to take and pass licensing exams. These challenges and a summary of the collective approaches that have been implemented by the schools represented in this paper follow.

Results

Challenges and Approach

Concern that students will not be sufficiently prepared for clinical clerkships without the benefit of the Step 1 study period to help consolidate knowledge

Challenge: Studying for the Step 1 exam requires students to revisit basic science concepts and facilitates the integration of basic and clinical sciences. In a traditional 2 + 2 curriculum where the first

year covers normal processes and the second year focuses on the abnormal, this study period has been an important opportunity for students to integrate the two years of material. Moving the exam, and therefore the study period, to follow the clerkships can be a source of concern for faculty who worry that students will arrive to the clerkships less prepared to apply their fund of knowledge to clinical care.

Approach: In addition to re-positioning the Step 1 exam, all of our schools instituted curricular modifications aimed at fostering more deliberate integration of basic and clinical sciences, including the concurrent presentation of normal and abnormal processes in the pre-clerkship phase. We believe this allows students to apply their emerging knowledge of basic science to patient care earlier and more consistently[5] and may reduce reliance on the traditional pre-clerkship Step 1 study period for this form of knowledge consolidation and integration. Our revised curricula also focused more on pedagogies that foster deep, enduring learning, including team-, case- and problem-based methods. These pedagogies encourage students to take time to think, learn, and apply knowledge rather than emphasizing the recall of facts. Time to thoughtfully analyze problems is not always immediately available in the midst of a busy clinic, or on ward rounds. Thus, students may experience a steeper initial adjustment period to the on the spot, rapid-fire questions typically encountered on clerkships focus on rapid recall. Proactive, clear and consistent communication explaining both the new curriculum and the rationale for altering the timing of Step 1 is key to addressing the concerns of front-line faculty and students about preparedness. Any innovation that disrupts the informal student-to-student and resident-to-student grapevine can increase student anxiety. Thus, communicating the change to senior students and residents is also critical, as they are trusted sources of information for junior learners. The most intense communication should occur surrounding the transition, and then continue as part of onboarding, as new residents and faculty arrive each year from other institutions.

Risk that weaker students will not be identified and provided academic support early in medical school

Challenge: The USMLE Step 1 exam has traditionally been used as a gateway exam, with students not permitted to advance to clerkships until they have taken and passed Step 1. Students who have difficulty in preparing and/or sitting for the exam were identified and provided with extra support. By moving Step 1 after clerkships, there is concern that students with weaker medical knowledge might escape early detection and these students may be at risk of failing subject exams or Step 1 at a later time. Delayed identification of academic insufficiency could lead to the decision to withdraw from medical school at a later stage of the medical training program resulting in elevation of incurred financial cost.

Approach: An institution's internal assessment measures are a useful means to identify students struggling to meet institutional competencies, however, they only partially align with a comprehensive external exam such as USMLE Step 1. Use of the NBME's comprehensive basic science self-assessment (CBSSA) or comprehensive basic science exam (CBSE) can be useful adjuncts to help identify and provide early support to students who might struggle on future NBME exams. The University of Michigan uses a passing threshold of 50 for a CBSE administered just prior to clerkships, as this appears to correlate with future subject exam failures. Learners who do not meet the threshold are required to meet with the learning specialist, develop a study plan and take the CBSE again midway through clerkships. Michigan is now experimenting with using the CBSE as a progress test so students can be made aware of their individual learning trajectories and struggling students can be identified and assisted earlier (6). Use of institutional progress tests or cumulative exams can also help avoid situations in which students might develop an illusion of competence (7), becoming overconfident in

thinking that their performance on each medical school basic science exam is a stable representation of their fund of knowledge in that topic (8). Once the new curricula and associated internal assessment measures are more established, institutions can re-assess the need to use external exams such as the CBSE or CBSSA to help predict shelf exam and Step 1 performance.

NBME clinical subject (shelf) exam performance may decrease

Challenge: All five of our institutions have noted some decrements in subject exam scores, particularly in the earliest clerkships and in those with the greatest breadth (e.g. internal medicine or family medicine) (9). Weaker exam scores can contribute to clerkship failures and an overall impression that students are not as strong as they "used to be". We hypothesize that subject (shelf) scores decline for several reasons: 1) Learners have had less total "time on task." An early second-year student entering clerkships is very different than a late second- or early third-year student. 2) Step 1 preparation prior to the clerkships provides students with an opportunity to consolidate their foundational knowledge and offers an additional pass through the material prior to clinical rotations. 3) Studying for and taking Step 1 may help learners develop the self-discipline and stamina needed to take long, timed, high-stakes multiple choice exams, and adjust to board-style questions (10).

Approach: Practical measures can be taken to enhance the likelihood of student success on NBME shelf exams. First, students should be encouraged to consolidate knowledge throughout the pre-clerkship curriculum. Second, students need exposure to standardized or timed NBME-style exam testing before taking their first shelf exam. Three of our five schools use the NBME customized assessment exams during the pre-clerkship phase (see Table 2.) USUHS initially administered a formative CBSSA prior to the start of clerkships, but later eliminated it as they found that performance

on the customized NBME exams and faculty derived exams was equally predictive. The University of Michigan is considering switching from using the CBSE to the CBSSA, in order to provide students with more detailed formative feedback to guide studying during clerkships based on personal strengths and weaknesses.

Adjustments to the minimum passing standards on clerkship shelf exams may be needed. NYU adjusted their passing grades and decreased the weighting of clinical subject exam scores to 10% of the clerkship grade, across all clerkships. Vanderbilt transitioned from having grades (e.g., honors, high pass, pass, fail) to pass / fail in their clerkships. Institutional policies and procedures can be adjusted such that early and/or initial shelf failures are first recorded as an incompletes—giving the student a chance to remediate the exam before the grade is formally recorded as a failure on the student transcript. These changes may only be temporary, as the institution's assessment systems adjust to better prepare students for shelf exams, or they may remain as part of the new norm, with institutional recognition that earlier learners may need different standards.

Potential to overextend the length of step exam preparation

Challenge: The new position of the Step 1 exam can allow students a bit more flexibility in the length of time they have to study, since the shortened pre-clerkship curriculum places the exam within an expanded period of elective time in their third year. Thus, learners may delay the start of electives. Our collective experience has been that most students generally do not need to extend their study time despite the extended gap between the initial presentation of the essential basic science content and Step 1. In fact, some students require less time to study. However, unless there is a fixed date by which students must embark on the remaining curriculum, students have the potential to want to over-extend

their exam preparation. This flexibility can pose challenges for students who feel pressured to obtain high scores to match into competitive specialties or for learners struggling with test-anxiety, who have a propensity to want to delay taking the exam. As students study and take practice tests that do not reflect the level they aspire to, they may start to reconsider their test date and move it further out to give them more time. The hazard is two-fold 1) they reach a point at which they are mentally tired, feel defeated and continue to postpone and 2) they are progressively further away from the first content that they studied. On the other hand, for students who have weaker funds of knowledge and/or who have difficulty with standardized tests, this additional flexibility can be helpful in allowing them some extra study time.

Approach: Providing students academic support is especially important as some students may need additional guidance in navigating and designing their post-clerkship review process. Deans, learning specialists, and those advising and coaching students need to be aware of and anticipate these unintended consequences in order to effectively and proactively mitigate their impacts. This includes providing students with a proper orientation and resources (11). For example, schools might consider scheduling a Step 1 orientation session near the beginning of the clerkship year, to discuss how to study for Step 1 during clerkships (e.g. through interleaving, spaced repetition of questions, etc.), what a prototypical study regimen /preparation timeline might look like, what supplementary resources are available, and how a baseline CBSSA or CBSE score can be used to help develop an individualized study strategy. As the clerkship year comes to a close, students can be provided with more specific guidelines as to how to organize their time, how/ when to take a CBSSA to develop an individualized study strategy.

Doing this preemptively can help reduce student anxiety. Once upperclassmen gain experience with taking Step 1 after clerkships, they are better poised to advise learners who are just beginning to prepare for Step 1, on effective strategies, and this can go a long way towards mitigating student anxiety about the repositioned exam. During the transition, it may be helpful to encourage students to communicate with students at other schools who have already moved the exam through the Organization of Student Representatives of the Association of American Medical Colleges.

Four schools (Columbia, USUHS, NYU and Vanderbilt) have established Step 1 deadlines by which students must take the exam. Case-by-case exceptions are sometimes made for students who are in crisis or for those who have CBSSA scores in the failing range. In such cases, students work with a learning specialist to improve studying practices. Some schools provide or recommend supplemental resources—to include the use of commercially or locally derived question banks, and customized academic coaching to help students determine their readiness to take and pass Step 1.

Some Step 1 preparation can take place during clerkships. This can be done through the use of spaced education (e.g., spaced repetition of questions relating to the basic sciences) by individual students and through the deliberate interleaving of basic sciences into the clerkship curricula, through didactics, grand rounds, journal clubs, etc.

Increased student anxiety and/or potential for misguided specialty choices

Challenge: Even though the Step 1 exam was originally intended to ensure the attainment of foundational competence in the basic sciences, the reality is that the three-digit score is often used to differentiate cohorts of students by performance. As a result, beginning the clerkship year without the advantage of a Step 1 score can potentially increase students' anxiety about whether their anticipated

specialty choice is indeed a realistic option. Students who have already identified a specialty may end up expending emotional energy worrying over whether their Step 1 score will be high enough to ensure they will be competitive. Some students may discover—at a relatively late point in time, that their Step 1 score simply makes the immediate pursuit of some of the most highly competitive career fields unrealistic. This thereby causes students to re-evaluate their long-term career plans closer than what might have been anticipated, to the National Match. The heightened focus on Step 1 scores has become increasingly pervasive throughout graduate medical education (GME), despite the fact that the Step 2 Clinical Knowledge (CK) score tends to have a much stronger correlation with students' performance in residency (12). That said, the current timing of Step 2CK is such that scores are not consistently available to the programs during the selection process, which contributes to a greater emphasis placed on Step 1 scores.

Approach: Even with the later timing of the exam, Step 1 scores are generally available early enough in third year to allow ample time to solidify residency preferences, create a parallel path or back-up plan (if needed), and actively prepare for Step 2 exams. On the plus side, a delayed Step 1 exam has the benefit of allowing students the opportunity to evaluate their interest in a particular specialty during the clerkship year, without the added pressure of having to consider the impact of their Step 1 score. For students planning to pursue highly competitive specialties, they can benefit from knowing target goals for Step 1 performance to aim for. MCATs, pre-clerkship performance, and subject scores tend to correlate with Step 1 scores, so while all students should be encouraged to pursue areas that reflect their professional passion, an element of pragmatic realism may need to be interjected into the aspirational process.

As additional data becomes available about learner performance when the Step 1 exam is administered after the core clerkships, it is possible that we may find that learner anxiety may actually be lessened and wellness enhanced, particularly if average scores modestly increase and failure rates decline. In a to-date unpublished analysis, it appears that scores improve the most for the lowest performing quartile of students, whereas the highest performing quartile encounters a ceiling effect (8). This is particularly welcome news for students who may struggle on Step 1. Based on our students' feedback to date, learners generally like the repositioned Step 1 exam. Upperclassmen often tell more junior students that the experience of taking NBME shelf exams prepared them well for Step 1. In our collective experience, student anxiety is highest in the first year after the change, until the upperclassman grapevine can provide reassurance and even encouragement about the new timing.

Reduced time--prior to graduation for taking and passing USMLE Step 1 and Step 2 Clinical Knowledge (CK)

Challenge: Thus far all schools that have re-positioned the administration of the Step 1 exam have done so in conjunction with other forms of curricular revision – all have included a shortening and modification of the traditional, pre-clerkship phase. In addition, some schools have significantly trimmed the summer between year 1 and 2. Therefore, students finish pre-clerkship 12-18 months after starting medical school, and proceed almost immediately into their core clerkships. The students in our schools complete Step 1 in August (Vanderbilt), November (UMichigan) and February (Columbia, NYU and USUHS) of the 3rd year. Students who complete Step 1 in February have a significantly shortened window to take and pass their Step 1 and Step 2 exams, both of which may be required for graduation. Students who complete Step 1 earlier potentially have an increased lag time between finishing clerkships and taking Step 2.

Approach: The period between Step 1 and Step 2 CK can be successfully navigated with careful and thoughtful advising on scheduling. Key things to consider include: 1) some specialties expect and even require away rotations (e.g. Emergency Medicine), 2) a growing number of programs want students to complete Step 2 early in the application cycle, 3) some students use Step 2 CK to make up for a lower Step 1 score, 4) a small number of students will apply to residencies with an early match (e.g. Ophthalmology, Urology), and 5) sufficient time for remediation may be needed if passing Step 1 and Step 2 is a graduation requirement.

Keeping these considerations in mind a student who receives their Step 1 score as late as the end of March could schedule Step 2 anytime between May and October, which still allows a break between the two high stakes exams and offers sufficient time to schedule away rotations and advanced clerkships. Prior studies have suggested that Step 2 CK scores decline with increasing time from completion of the core clerkships.[13] Thus, some schools (e.g., University of Michigan) are advising students to take the exams in rapid succession, allowing just enough time to get the Step 1 score back and make necessary studying adjustments. Scores can then be included as important data points in the residency match process, decreasing the influence of Step 1 with potential implications on student well-being. Other schools (e.g., Columbia) are advising students to take a longer break between preparing for Step 1 and 2, in order to reduce the impact of burnout and mental exhaustion associated with preparing for two high-stakes examinations in back-to-back succession. Regardless of the Step 2 timing strategy, we have not observed a change in Step 2 scores at our institutions with the repositioned Step 1.

Discussion

A central question thus emerges: Should all schools re-position the timing of the administration of the Step 1 examination? We believe that repositioning the timing of USMLE Step 1 should be considered by institutions undergoing curricular reforms that both shorten the pre-clerkship phase and aim to enhance the integration of basic and clinical science. We do not recommend changing the timing of Step 1 in the absence of these other curricular changes. For schools with traditional 2+2 curricula, a shift in Step 1 timing would place it far too close to the residency application season. For schools considering altering the timing of Step 1, there are a number of challenges to consider and we provide approaches based on our experience to optimize a successful transition. All of the potential challenges can be addressed using three main strategies – effective communication about curricular changes to all stake holders, focused curricular design and assessments that facilitate integration of basic and clinical sciences from day one, and thoughtful student coaching and advising.

As schools consider and plan any large-scale organizational change, anticipating and planning for challenges is an important part of the process. Transparent communication about the reasons for, and process of, the change can be as important in people's impression of the changes as the actual outcomes. Additionally, any negative outcomes can be better accepted if the change process is managed and communicated effectively (14). Communication and planning should include important stakeholders, such as academic advisors, learning specialists, counsellors, and student wellness and mental health services, who can all help to plan and support students through the Step 1 timing change. Ensuring that students are studying in an effective manner and are actively managing their anxiety and stress are key to student success.

Limitations

The major limitation of this report pertains to the fact that it represents the views and experiences of only 5 of the 18 U.S. medical schools that have decided to delay administration of the Step 1 examination until after the core clerkship year. Admittedly some of these schools were among the earliest of 'adopters' of this change, but since other schools are still in the process of implementing the delayed Step 1 exam, they may be encountering different challenges, so the issues described in this paper may not be universally applicable. Similarly, the views conveyed in this paper represent some of the most significant challenges identified by Decanal-level faculty from a limited number of schools; it is possible that students and/or other faculty may have perceived the presence of other, equally noteworthy, challenges.

Conclusion

Curriculum revision and the re-location of the Step 1 exam to the post-clerkship period provides schools with a unique opportunity to revisit and strengthen their assessment procedures and to further tailor their educational examination infrastructure, so as to strengthen and promote long-term learning and understanding and preparation for clinical performance.

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CHAPTER 4: CURRICULAR MONIKERS: WHAT'S IN A NAME?" -- AN ANALYSIS OF CURRICULAR NAMES/THEMES IN NORTH AMERICAN MEDICAL SCHOOLS

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Abstract

An increasing number of North American medical schools are assigning unique names ("monikers") to their undergraduate curricula, but it is unclear as to how often this occurs, and what kind of names schools are choosing. A manual review of the 160 websites that corresponded to Schools of Medicine that were either fully or provisionally accredited by the Liaison Committee on Medical Education (LCME)(2) revealed that 31.5% of the 143 U.S. allopathic medical schools and only one (5.8%) of the 17 LCME accredited Canadian medical schools currently associate a unique curricular name with their undergraduate medical education programs. Use of a constant-comparative technique suggested that schools that did assign a curricular name to their programs had selected names that aligned to one of eight over-arching themes.

While curricular names were somewhat less commonly applied in schools located in the western United States, no specific trends in thematic choices predominated in any geographic region. However, the impact of curricular themes on current and/or prospective medical students remains an area for continued exploration, as does the longitudinal question as to whether thematically named curricula succeed in delivering their intended results.

Introduction

An increasing number of North American medical schools appear to be associating their medical school curricula with a unique name. Although it is difficult to determine exactly when this phenomenon first began, it appears to be an increasingly common trend. This in turn, leads to the question of "what's in a name," and do curricular names even matter? The answers to these seemingly straightforward questions have the potential to provide a concise means of providing educators and prospective applicants with some notable insights into the overall design and focus of a medical school curriculum.

Methods

During the period of 15 May – 10 June 2018, a manual search of all full or provisionally, LCME accredited (2) (N=160; 143 U.S and 17 Canadian) School of Medicine websites was conducted, supplemented by the use of site-specific searches, using terms such as "curriculum", "academics," "school of medicine," "medical student," and "MD degree." To triangulate our findings, this website review was supplemented by a review of feedback received from the results of the North American survey of medical schools referenced above. As noted, the Qualtrics based survey was sent to the Associate Deans for Education and/or to the Associate Deans for Curriculum at all North American medical schools accredited by the LCME and included a question specifically asking, "does your current or revised curriculum have a name?" Finally, to further reduce the likelihood that any curricular names were inadvertently overlooked, three colleagues (SD, WG, and LP) each re-reviewed a randomized selection of 5% of websites for which a curricular name was not identified in the primary review. None of these secondary reviews identified a unique curricular name.

Criteria for inclusion were educational programs that had a unique curricular name that encompassed the entire program of undergraduate medical education and that pertained to a single-tracked, medical degree (MD) programs. Names that applied to a specific pathway within the curriculum–such as "Leadership Curriculum" or a "Rural Medicine" track were excluded. Combined programs (ex: MD/PhD) were excluded.

Other exclusionary criteria were general descriptors--such as "The MD Curriculum," or "Integrated Curriculum." Names were, however, included, if they were associated with another descriptor—ex: "Vermont Integrated Curriculum" or VIC. Additionally, names or titles that primarily incorporated the name of the school alone (e.g: "Boston University School of Medicine Curriculum" or "University of Louisville School of Medicine Curriculum"), or the name of the campus (ex: "Hershey Curriculum" and "University Park Curriculum" at the Penn State College of Medicine) were also excluded. Finally, we also excluded names related to specialized programs within the schools. For example, the "Flexible MD" program at the University of Minnesota that allows up to six years for completion, or the three-year "Accelerated Curriculum" at Penn State College of Medicine. Results are presented in the following Table.

TABLE 1: CURRICULAR NAMES LISTED BY SCHOOL AND REGION

SCHOOL	GEOGRAPHIC REGION *	CURRICULAR NAME	WEBLINK	NOTES
Albany Medical College, NY	Northeastern	Comprehensive Core Curriculum	http://www.amc.edu/academic/undergraduate/LCME/upload/curriculum-map-2017.pdf	
Boonshoft School of Medicine, Wright State University, OH	Midwestern	WrightCurriculum	https://medicine.wright.edu/student-life/curriculum/wrightcurriculum	Began in 2017, entering Class of '21
Case Western Reserve University School of Medicine, OH	Midwestern	Western Reserve2 Curriculum (WR2)	http://casemed.case.edu/curriculum/education/index.cfm	Launched 2006
Charles E. Schmidt College of Medicine at Florida Atlantic University, FL	Southern	Integrated Patient-Focused Curriculum (IPF)	http://med.fau.edu/ume/index.php	
Columbia University Vagelos College of Physicians and Surgeons, NY	Northeastern	Columbia MD Curriculum	https://www.ps.columbia.edu/education/academic-programs/md-program	
Drexel University College of Medicine, PA	Northeastern	Foundations and Frontiers	http://drexel.edu/medicine/academics/md-program/curriculum/	Launched, August 2017
Duke University School of Medicine, NC	Southern	Foundation for Excellence Curriculum	https://medschool.duke.edu/education/student-services/office-curricular-affairs/about-duke-curriculum	
Eastern Virginia Medical School, VA	Southern	CareForward Curriculum (CFC)	https://www.evms.edu/education/medical_programs/doctor_of_medicine/careforward_curriculum_/	
Georgetown University School of Medicine, D.C	Southern	Journeys Curriculum	https://som.georgetown.edu/curriculum-reform-2#	
Harvard Medical School, MA	Northeastern	1. Pathways	https://meded.hms.harvard.edu/pathways	1. Launched in 2015 (Previously called New

SCHOOL	GEOGRAPHIC REGION *	CURRICULAR NAME	WEBLINK	NOTES
		2. Health Sciences & Technology	https://meded.hms.harvard.edu/academic-calendars (discrete curricular maps)	Pathway; see https://meded.hms.harvard.edu/new-pathway) 2. Joint program, Harvard & MIT
Johns Hopkins University School of Medicine, MD	Northeastern	Genes to Society	https://www.hopkinsmedicine.org/som/admissions/md/curriculum_degrees/	Instituted in 2009
Mayo Clinic School of Medicine, MN	Midwestern	Science of Health Care Delivery	http://www.mayo.edu/mayo-clinic-school-of-medicine/programs/md/curriculum/science-of-health-care-delivery	Collaborative effort with Arizona State University
McMaster University Faculty of Medicine, Michael G. DeGroote School of Medicine	Canada	COMPASS	https://mdprogram.mcmaster.ca/mcmaster-md-program/what-is-compass2/what-is-compass	Launched in 2005; fosters competencies in communicator/collaborator, advocate/resource manager, scholar/learner and self-reflective practitioner.
Medical College of Wisconsin	Midwestern	Discovery Curriculum	http://www.mcw.edu/Medical-School/Discovery-Curriculum.htm	
Meharry Medical College School of Medicine, TN	Midwestern	Next Step (Successfully Training Equipped Physicians)	https://home.mmc.edu/name-the-curriculum-contest/	Verbal communication with Office of the Dean.
Michigan State University College of Human Medicine	Midwestern	Shared Discovery Curriculum	http://curriculum.chm.msu.edu/	Pilot testing components began in 2013;
New York University School of Medicine	Northeastern	Curriculum for 21st Century (C21)	https://med.nyu.edu/education/md-degree/md-curriculum/	
Oregon Health & Science University School of Medicine	Western	Your M.D	https://www.ohsu.edu/xd/education/schools/school-of-medicine/academic-programs/md-program/curriculum/your-md-details.cfm	Launched August 2014

SCHOOL	GEOGRAPHIC REGION *	CURRICULAR NAME	WEBLINK	NOTES
Sidney Kimmel Medical College at Thomas Jefferson University, PA	Northeastern	JeffMD	https://www.jefferson.edu/university/skmc/about/jeffmd.html	Launched July 2017, Class of '21
Stanford University School of Medicine, CA	Western	Discovery Curriculum	http://med.stanford.edu/md/discovery-curriculum.html	Offers both a 2 & 3 year pre-clerkship option
Stony Brook University School of Medicine, NY	Northeastern	LEARN Curriculum (Learning Centered, Experiential, Adaptive, Rigorous and Novel)	https://medicine.stonybrookmedicine.edu/ugme/education/MD	Initiated in August 2014 (Class of '18)
SUNY Downstate Medical Center, College of Medicine, NY	Northeastern	Integrated Pathways Curriculum	http://www.downstate.edu/curriculum-renewal/index.html	Started in fall, 2008
The Ohio State University College of Medicine	Midwestern	Lead. Serve. Inspire (LSI)	https://medicine.osu.edu/students/lsi_curriculum/pages/index.aspx	
The Raymond and Ruth Perelman School of Medicine at the University of Pennsylvania	Northeastern	Learning for Life	http://www.med.upenn.edu/admissions/module-1.html	
The Robert Larner M.D College of Medicine at the University of Vermont	Northeastern	Vermont Integrated Curriculum (VIC)	http://med.uvm.edu/docs/vic/medical-education-documents/vic.pdf?sfvrsn=16	
Uniformed Services University of the Health Sciences, MD	Southern	Molecules to Military Medicine	www.usuhs.edu	Launched 2011; Class of '15
University of California—Irvine School of Medicine	Western	iTEACH Curriculum (Technology Enhanced, Activity Coordinated, Humanistic Curriculum)	http://www.meded.uci.edu/curricular-affairs/index.asp	
University of California—San Diego School of Medicine	Western	Integrated Scientific Curriculum (ISC)	https://meded.ucsd.edu/index.cfm/ugme/curriculum_requirements//core_curriculum/	Initiated with class that matriculated in 2010

SCHOOL	GEOGRAPHIC REGION *	CURRICULAR NAME	WEBLINK	NOTES
University of California—San Francisco	Western	Bridges Curriculum	http://meded.ucsf.edu/bridges	Launched in August 2016; 3 phased curriculum delivered over 4 yrs: Foundations I & II, & Career Launch
University of Chicago, The Pritzker School of Medicine, IL	Midwestern	The Pritzker Initiative	https://pritzker.uchicago.edu/page/md-curriculum	Series of curricular revisions initially implemented in 2009, & completed in 2012
University of Connecticut School of Medicine	Northeastern	M Delta Curriculum (Making a Difference in Education, Learning, & Teaching Across the curriculum)	https://medicaleducation.uconn.edu/curriculum/m-d-curriculum/m-delta-curriculum/	For students in Class of '20 & beyond
University of Illinois, Chicago College of Medicine	Midwestern	Innovation Medicine	https://chicago.medicine.uic.edu/education/md-curriculum/campus-specific-programs/innovation-medicine-imed/	Program augments existing curriculum in College of Medicine; open to 12 students/yr
University of Kansas School of Medicine	Midwestern	ACE Curriculum (Active, Competency Based, Excellence Driven)	http://www.kumc.edu/school-of-medicine/education/ace-curriculum.html	Curricular revision process began in 2014, implemented with matriculating class, Summer of 2017
University of Kentucky College of Medicine	Southern	Kentucky Integrated Curriculum	http://meded.med.uky.edu/curriculum-overview	
University of Nebraska College of Medicine	Midwestern	Training the Physicians of Tomorrow (TPT)	https://www.unmc.edu/com/curriculum/Training-the-Physicians-of-Tomorrow1/index.html	Started with graduating Class of '21 (students matriculating in 2017)
University of North Carolina School of Medicine	Southern	Translational Education at Carolina (TEC) Curriculum	http://www.med.unc.edu/md/curriculum/tec-curriculum-information/tec-overview	Launched August 2014

SCHOOL	GEOGRAPHIC REGION *	CURRICULAR NAME	WEBLINK	NOTES
University of Rochester School of Medicine and Dentistry, NY	Northeastern	Double Helix Curriculum: Integrating Basic Science and Clinical Medicine through a Four-Year Biopsychosocial Continuum	https://www.urmc.rochester.edu/MediaLibraries/URMCMedia/education/md/documents/dhc.pdf	
University of Tennessee Health Science Center College of Medicine	Southern	Physicians for the FUTURE Curriculum	http://www.uthsc.edu/Medicine/OLSEN/documents/physicians-for-the-future-curriculum.pdf	
University of Texas at Austin, Dell Medical School	Southern	Leading EDGE Curriculum (Essentials, Delivery, Growth and Discovery)	https://dellmed.utexas.edu/education/academics/undergraduate-medical-education/leading-edge-curriculum	MS-I Year= Essentials, MS-II = Delivery, MS-III=Growth, MS-IV=Discovery
University of Texas Joe R. and Teresa Lozano Long School of Medicine, TX	Southern	CIRCLE (Curricular Integration: Researchers, Clinicians, Leaders, Educators).	http://som.uthscsa.edu/UME/curriculum.asp	Implementation began, 2012; Class of 2016 first to graduate under this program
University of Texas Southwestern Medical Center, Southwestern Medical School	Southern	Foundation for Excellence Curriculum	https://www.utsouthwestern.edu/edumedia/edufiles/medical_school/academics/curriculum-main-chart.pdf	New curriculum—starting with graduating Class of '19
University of Virginia School of Medicine	Southern	Next Generation (NxGen) Cells to Society Curriculum	https://med.virginia.edu/ume-curriculum/curriculum/advancing-the-curriculum/	
University of Wisconsin School of Medicine and Public Health	Midwestern	ForWard Curriculum	https://www.med.wisc.edu/media/medwiscedu/documents/education/md-program/md-curriculum-w-graphic.pdf	Entering Class of 2016 & beyond
Vanderbilt University School of Medicine, TN	Southern	Curriculum 2.0	https://medschool.vanderbilt.edu/ume/	

SCHOOL	GEOGRAPHIC REGION *	CURRICULAR NAME	WEBLINK	NOTES
Virginia Commonwealth University School of Medicine, VA	Southern	C^3 Curriculum	https://medschool.vcu.edu/md/	Initiated 2013; curriculum is **centered** on the needs of the learner, **clinically** driven, and **competency** based.
Wake Forest School of Medicine, NC	Southern	Wake Ready!	https://school.wakehealth.edu/Education-and-Training/MD-Program/Curriculum-Overview	

In order to better clarify the array of identified curricular names, a constant-comparative technique was utilized, beginning with a provisional review and alignment of each of the identified programmatic names into 12 potential categories. This preliminary categorization was drafted by the primary investigator (AP), and was subsequently reviewed, refined, and consolidated to a finalized list of 8 categories by a three-person subgroup that included two additional, USU billeted, senior educators. A comparative qualitative approach was then used to achieve complete consensus on the noted findings. The finalized designation and alignment of the curricular names into these 8 categories is reflected in the next Table.

TABLE 2: CURRICULAR THEMES—BY CATEGORY

Curricular Themes	Curricular Name
Exploration/Transition/Journey Related: (N=9) *Curricular names referring to themes of broadening horizons and/or personal growth over time.*	➢ Bridges Curriculum ➢ Discovery Curriculum* ➢ Foundations and Frontiers ➢ Journeys Curriculum ➢ Next Step (**S**uccessfully **T**raining **E**quipped **P**hysicians) ➢ Pathways ➢ Shared Discovery Curriculum ➢ Wake Ready *Same name used by two different schools
Science/Technology Related: (N=8) *Curricular names evoking emphasis on the ability to better leverage the interface of science and technology.*	➢ Double Helix Curriculum: Integrating Basic Science and Clinical Medicine Through a Four-Year Biopsychosocial Continuum ➢ Genes to Society ➢ Health Sciences & Technology ➢ Innovation Medicine ➢ Integrated Pathways Curriculum ➢ Integrated Scientific Curriculum (ISC) ➢ Molecules to Military Medicine (M2MM) Curriculum ➢ Next Generation (NxGen) Cells to Society Curriculum
Patient/Clinically Focused (N=4)	➢ ACE Curriculum (**A**ctive, **C**ompetency Based, **E**xcellence Driven)

Curricular names focusing on enhancing students' ability to provide advanced clinical care.	➢ C^3 Curriculum (**C**entered on the learner, **C**linically driven, **C**ompetency based) ➢ Integrated Patient Focused Curriculum (IPF) ➢ Translational Education at Carolina (TEC) Curriculum
Focused on Change/Being an Agent for Change: (N=5) *Curricular names evoking images of the future and/or the ability to develop new approaches to healthcare.*	➢ Curriculum for the 21st Century (C21) ➢ Lead, Serve, Inspire (LSI) ➢ Physicians for the f**UT**ure Curriculum ➢ Science of Health Care Delivery ➢ Training the Physicians of Tomorrow (TPT)
Educationally Focused: (N=3) *Curricular names focusing on the need for life-long learning and the learning environment*	➢ CIRCLE (**C**urricular **I**ntegration: **R**esearchers, **C**linicians, **L**eaders, **E**ducators) ➢ LEARN Curriculum (**L**earning Centered, **E**xperiential, **A**daptive, **R**igorous, and **N**ovel) ➢ Learning for Life
Institutional Recognition: (N=7) *Curricular names highlighting the name of the corresponding medical school.*	➢ Columbia MD Curriculum ➢ JeffMD ➢ Kentucky Integrated Curriculum ➢ The Pritzker Initiative ➢ Vermont Integrated Curriculum (VIC) ➢ Western Reserve2 Curriculum (WR2) ➢ WrightCurriculum
Multiple Themes: (N=3) *Curricular names that evoke images of more than one theme.*	➢ iTEACH Curriculum (**T**echnology **E**nhanced, **A**ctivity **C**oordinated, **H**umanistic Curriculum) ➢ Leading EDGE Curriculum (**E**ssentials, **D**elivery, **G**rowth, and **D**iscovery) ➢ M Delta Curriculum (**M**aking a **D**ifference in **E**ducation, **L**earning, & **T**eaching **A**cross the Curriculum)
Other/No Clear Indication (N=8) *Curricular names which, when considered <u>without</u> the benefit of a corresponding review of the school's website, were not readily aligned into one of the aforementioned categories.*	➢ CareForward Curriculum (CFC) ➢ COMPASS Curriculum ➢ Comprehensive Core Curriculum ➢ Curriculum 2.0 ➢ Foundation for Excellence Curriculum* ➢ For**W**ard Curriculum ➢ Your M.D. *Same name used by two different schools

Results

Of the 143 U.S medical schools with full or provisional accreditation by the LCME, 45 schools had a unique name associated with their MD programs representing a prevalence rate of 31.4%. (Although only counted once, Harvard had two names—see Table 1). Of the 17 LCME accredited, Canadian medical schools, only 1 of 17 (5.8%) had a unique name associated with their MD programs.

While a variety of themes are represented by the listed array of curricular names, names relating to exploration and to the domains of science and technology were the most prevalent, followed closely by names associated with institutional recognition and by what we are calling complex and/or undifferentiated themes. No clear theme predominated among the 46 North American schools, however an increasing number of schools (N=8) appear to be employing the use of creative acronyms (ACE, M-Delta, CIRCLE, LEARN, Next Step, etc) to describe their curricular approaches and evoke correlating imagery.

Subsequent to completion of this initial, web-based analysis, respondents who participated in the North American survey of medical schools were asked "Does your school's curriculum have a name? If yes, what is it, and why did your school choose it?" In some cases, schools chose not to associate their curriculum with a distinct name as exemplified by the respondent who wrote: "We thought about naming it/branding it, but in the end decided that it was our curriculum—ever changing, ever-improving." On the other hand, some of the responding schools cited specific reasons for adopting a distinctive name, as reflected below:

TABLE 3: CURRICULAR NAME AND SCHOOL'S REASON FOR CHOOSING IT

Curricular Name	School's Reason for Choosing It
ACE Curriculum	*"Active, Competency-based, Excellence driven"*
C3 Curriculum	"*…because it is Clinically driven, Competency based and Centered on the need of the learner."*
CIRCLE Curriculum (Curricular Integration: Researchers, Clinicians, Leaders, Educators)	*"We liked the symbol of the circle—represented inclusion in a community and a never-ending cycle of self-evaluation and self-improvement. The acronym represents what skills we aim to develop in our students."*
Curriculum for the 21st Century	"*We called it Curriculum for the 21st Century to emphasize the need to think differently about education as a whole, as well as about change in the health care system. The name was aspirational."*
ForWard Curriculum	*"ForWard is the State of Wisconsin's state motto and seem appropriate to the forward thinking curriculum we devised. The W is capital on purpose for obvious reasons."*
JeffMD	"*…chosen by our students to capture the pride they have in Jefferson."*
Kentucky Integrated Curriculum	"*…to emphasize the integration of the foundational and clinical sciences"*
YourMD	*"…to emphasize the individualized curriculum that each student has in a competency-based framework."*
WakeReady	*"…plays off our name as well as 'Day 1 Readiness.'"*
Western Reserve2 Curriculum	*"This name was selected to honor the tremendously innovative curriculum at Western Reserve School of Medicine of the early 1950s. After a lot of working considering how we wanted to reform our curriculum, we discovered that we were really returning to many of our roots of the 1950s!"*

The WrightCurriculum	"*…based on our school's namesake—the Wright Brothers' who had to be pioneers in order to build a plane that could fly!"*

When the 45 U.S. schools with distinctive curricular names were analyzed in accordance with geographic region—using the four regions (Northeast, South, West, Midwest) defined by the U.S Census bureau, a relative paucity (N=5) of the 21 medical schools located in the Western United States (23.8%) had assigned specific names to their medical school curricula. This was in contrast to the number of Northeastern schools of which 13 of 34, or 38.2% had adopted a unique curricular name. Similarly, 12 of the 34 Midwestern schools (35.3%) had ascribed curricular names to their academic programs, as did 15 of the 54 Southern schools (27.8%). Efforts to identify trends in curricular themes used in different geographic regions were inconclusive, particularly given the relatively small number of curricular names that were aligned in any one category.

Using the 2017-2018 index of U.S. Medical School published in a recent edition of the *Journal of the American Medical Association (JAMA)(3)* as a guide, when considering medical schools in the 50 U.S. states, a relative predominance of private medical schools (19 of 51, or 37.3%) had assigned a specific name to their curricula, as opposed to the number of public medical schools (26 of 92 or 28.2%) that had done the same. An additional review, based on the duration of LCME accreditation (3), revealed that while 30 of the U.S. medical schools accredited on or prior to 1942 had assigned distinctive names to their curricula, only 11 of the U.S. schools accredited in the 30-year increment between the years 1943-1973 had done the same. Surprisingly only 2 schools accredited in the period between 1974-2004, and 2 schools accredited on or after 2005, had assigned specific curricular names to their curricula.

Discussion

Schools with distinct curricular names did not seem to associate with any single, predominant theme, nor was there a clear predilection for the use of distinct curricular identifiers in private vs. public, or new vs. long-standing medical programs. While a relative paucity of schools located in the western region of the United States had associated distinct curricular names to their programs, the significance of this finding remains unclear. While it appears that curricular names can be important—given that they succinctly convey important information about a medical school's educational program, a question that has yet to be answered involves determining whether there are any substantive differences between named versus unnamed curricula? And if so, in what ways?

As we look to the future, an intriguing, longitudinal question involves determining whether and how each of the curricular themes described above actually succeeded in delivering the intended results? Stated another way, have academic goals and objectives been modified so as to be fully concordant with the chosen moniker? For example, are students who matriculate to a change-oriented curriculum better prepared to innovate and implement positive change in the organizations in which they ultimately serve? Do these students tend to pursue career opportunities aligned with innovation and change? And, is there an inherent value proposition associated with assigning a specific name to an educational program?

Limitations

Limitations of this current exploration are associated with the fact that this review was based on information derived from publicly accessible websites. As such, it is possible that some schools may already have, or may be in the process of assigning a name to their curriculum but have not yet posted

this information on their public website. It should also be noted that this current review focused only on LCME accredited medical schools. Osteopathic schools were not included in this particular review, but a comparative analysis could serve as a foundation for a future report.

Conclusions

This study confirmed that a significant number of North American medical schools—U.S. medical schools in particular, have in fact incorporated the use of a distinct name when describing and/or marketing their undergraduate medical curricula. While there did not seem to be a singularly predominant category or theme, it does appear that in an era in which inter-personal communication increasingly revolves around the use of social media, and the dissemination of concise, character limited "Tweets", that the selection of a descriptive and informative curricular name can have strategic implications when it comes to attracting potential matriculants and prospective faculty.

That said, there are still some unanswered questions. For example, what influence, if any, do curricular names have on various subgroups of prospective medical students? Does the presence of a distinctive curricular name—or an implied curricular theme, attract, or detract consideration by prospective students? Finally, one might further explore the question as to whether or not the schools that have unique curricular names agree with the categorization suggested by objective reviewers? These are just some of the practical and programmatic questions that emerge when considering "what's in a name?"

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CHAPTER 5: DISCUSSION

This thesis conveys some of the emerging findings associated with a) a North American survey of curricular reform in undergraduate medical education, b) a collaborative, multi-institutional review of some of the challenges associated with a delayed administration of the USMLE Step 1 examination, and c) an analysis of the seemingly increased use of unique curricular names in North American medical schools. Using the results of a literature review, Chapter 1 aimed at elucidating what had already been published with respect to emerging national and international trends. This served as the foundation for the research reflected in Chapter 2, which used the results of a survey of North American medical schools to examine this question in a more expansive manner. While changes in curricular delivery were the most commonly reported form of self-reported curricular revision, these were closely followed by changes in curricular content and curricular structure/organization. Changes to forms of student assessment and the increasing use of technology and informatics were also identified, although these appear to be at a relatively nascent level. Each of these thematic alignments were illustrated by the inclusion of data extracted from free-text survey responses, in which responding schools self-reported some of their more unique approaches to UME related curricular innovation and expansion.

For example, a number of medical schools are expanding their curricula to deliberately address contemporary issues pertaining to social justice, health policy, and digital health, while at least one is incorporating Lean Six Sigma training for all of its medical students. Results of this research provides

evidence for an increasing need to deliberately prepare graduating medical students to not only assume the mantle of physician leadership and/or entrepreneurship, but to be better equipped to address the business aspect of medical practice as well. In fact, the increase of dual MD/MBA programs from six in 1993, to over 60 in 2018 (1) provides further evidence of this trend.

The changing scope, nature, and even societal expectations of what a physician is expected to accomplish is further exemplified by some of the newest medical schools. For example, at the Dell Medical School, medical students are not only afforded a full nine months to engage in a "Innovation, Leadership and Discovery" block, but are actively encouraged to engage in areas ranging from re-designing and innovating health care to becoming a "student entrepreneur in residence." (2) Even more 'revolutionary' is the approach used by the Carle Illinois College of Medicine, that seeks to foster the development of a new cadre of physician-leaders, who are "trained in medicine through the lens of engineering" (3), and who can actively embrace the growing interface between science, technology and medicine. Whether these modified curricula succeed in fully addressing contemporary societal needs and expectations is a question for future research.

As described in Chapter 3, one of the potentially more disruptive of curricular revisions involves relocating the Step 1 examination to a position after the core clerkships. Although this is still a relatively new phenomenon, it is an approach that appears to be garnering increasing interest, as manifest by a steady escalation of the number of schools now opting for a delayed administration of the Step 1 exam. Based on the experience garnered from five schools who were relatively early adopters of this approach, this chapter described some practical strategies that may be useful to schools who may be considering a similar change. These included the need to work with students as early and as proactively as possible, to help struggling students use their study periods more effectively, by encouraging use of one or more

robust Q-banks to deliberately enhance students' ability to analyze and answer higher-order, NBME type exam questions, and in helping students avoid placing undue stress and anxiety on themselves, particularly when cultivating seemingly unrealistic career aspirations.

Chapter 4 analyzed a more specific trend in undergraduate medical education—the phenomenon of associating a unique curricular name to medical school curricula. While a number of distinct and/or creative monikers were associated with 31.5% of LCME accredited schools in the U.S, no specific thematic elements predominated. Whether the association of a distinct curricular moniker to a medical school curriculum has any impact on a prospective applicant and whether the thematically named curricula delivers its intended result, are two additional questions for longitudinal exploration.

Putting things in perspectives, this research highlighted a few central themes that academic leaders and Deans might find beneficial when designing and/or modifying future medical school curricula. First, as John F. Kennedy once said, "*change is the law of life and those who look only to the past or present are certain to miss the future*." (4) This is particularly significant for while change management can be a challenging—and daunting prospect, the potential rewards can be both immeasurable and long-lasting. Second, while the 2010 Carnegie Foundation report included some salient "calls for action," it should be noted that it focused on four specific processes and was based on a relatively limited survey of contemporary medical schools. So, while these avenues for action should still be heeded, they should not distract nor preclude schools from continuing to innovate, and from ensuring that emerging curricula are responsive to the challenges and health needs of an increasingly diverse global society. As such, embracing opportunities to continually expand the boundaries of early inter-disciplinary and inter-professional curricular integration, and competency driven education should be viewed as pivotal foundations for future success.

Limitations

As discussed in Chapter 2, one of the major limitations of this study relates to the less than optimal response rate (36.5%) to the North American survey. As such, the results may not be fully representative of North American schools at large, and particularly those in Canada. The heavy reliance on free-text responses—which were designed to maximize the identification and sharing of truly innovative educational approaches, may, in retrospect, have elicited a heavier than expected cognitive load which may also have impeded the completeness of some of the responses, potentially contributing to one of the study's limitations.

Turning to Chapter 3, it should be noticed that this paper focused on the collective experiences of five medical schools, whose experiences may not be generalizable to others. Chapter 4 investigated the use of curricular monikers, however the analysis focused on information that was included on publicly accessible websites and may not be reflective of initiatives that are still under development. Moreover, the analysis focused on LCME accredited North American medical schools and did not extend to an evaluation as to whether a similar trend might be evident in osteopathic and/or naturopathic schools, or to the international community at large.

Finally, it should be noted that while this research sought to identify some new and emerging trends in curricular revision, it is simply too early to determine whether and/or which of these, will ultimately emerge as "best practices," worthy of emulation.

Military Relevance & Next Steps

In addition to serving as the initial steps towards developing a North American database of new and emerging curricular revisions, challenges and trends, this work further highlighted the importance

of leadership skills, and indirectly illustrated how many of the leadership skills and abilities cultivated in the military—which is well known for cultivating leaders who can adapt to evolving challenges and new missions--can be adapted to facilitate change in academic environments as well.

In addition to the research questions previously noted, an intriguing avenue for further research would be to systematically visit and explore the delivery of undergraduate medical education in some of the predominantly non-English speaking areas of the world. This could be initiated by first re-tracing the footsteps of Abraham Flexner and visiting medical schools in the regions that were included in his second Carnegie Foundation report-- "*Medical Education in Europe*" (5), which was published in 1912. This report focused on the delivery of medical education in areas formerly known as the German Empire, as well as in the countries of Austria, France, England and Scotland. Expanding this effort to include medical schools in nations in Asia, Africa and the Middle East could be of direct military relevance, given the opportunities for promoting and/or enhancing, international communication and collaboration.

In fact, a shared focus on new and emerging approaches to undergraduate medical education could easily allow for the collegial and non-threatening amplification of military-medical diplomacy. In fact, by sharing and communicating new and/or innovative practices associated with the design and delivery of health-related education and training, substantive insights into the promulgation of true, cross-cultural medical communication could be gained, which could not only improve the global delivery of health, but could also lead to enhancements in global trust, security, and cooperation.

Finally, this research was guided by a theoretical framework that was based on social-cognitive theory (6). Although other frameworks were considered, the social-cognitive theory proved to be particularly useful, as it allowed for the research questions—and emerging answers, to be analyzed in

view of the complex interplay between personal, behavioral and environmental factors. In short, social-cognitive theory allowed for the simultaneous consideration of key elements pertaining to the conceptual constructs of behaviorism (practice and performance), cognitivism (strategies), social learning (inter-personal interactions), and constructivism (focus on meaning), (7) while also taking into account environmental factors. (6) This approach was particularly efficacious given that efforts to implement curricular revisions—at any level, were found to be highly dependent on an institution's ability to effectively engage institutional leaders, develop a network of positive, interpersonal relationships, foster strategic communications and behaviors, and inspire academic communities to create environments that promote a culture of creativity and innovation. And, perhaps even more important, an environment that communicates a genuine willingness to endorse academic growth and change. The fact that social-cognitive theory promotes the idea that institutions can learn from, and leverage, the experience of other institutions by sharing observations and analyzing challenges and obstacles that were overcome, further underscores the utility of this particular conceptual framework.

Conclusions

On a broader scale, one of the unifying themes that arose from this project relates to the challenges of implementing academic change, and the difficulties that are often associated with change management in general. This was exemplified by the prominent reference to "faculty" when survey respondents were asked to identify the most significant challenge(s) that were encountered when contemplating curricular change. That said, implementing academic change can often be facilitated if the associated leadership team recognizes that while change is an event, transition—to a new curriculum or

other major innovation, is a process. The process of implementing and managing a major transition was aptly described by William Bridges, who notes that

> "The starting point for transition is not the outcome, but the ending that you will have to make to leave the old situation [curriculum] behind….[the] psychological transition depends on letting go of the old reality and the old identity you had before the change took place. Nothing so undermines organizational change as the failure to think through who will have to let go of what when the change occurs."(8)

Whether "letting go" involves de-constructing the familiar structure of a long-standing, course-based curriculum, or eliminating reliance on the traditionally delivered, 50-minute lecture—wherein students were expected to be attentive and present in the lecture hall, the challenges of implementing truly revolutionary curricular change are often underestimated.

In conclusion, while the 2010 Carnegie report highlighted several key areas for educational enhancement and reform, it is evident that nearly ten years later, there is still much to be done. This research paper identified a number of contemporary challenges and trends, to include the association of curricular monikers to medical school curricula. And, while the "wheels" of curricular change may be slow to move, the willingness to explore alternative delivery systems and change our thinking about what is indeed the best approach for developing the next generation of physicians, is the first step in changing the process of medical education for generations to come.

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TABLES AND APPENDICES

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May 01, 2018

MEMORANDUM FOR Col (Ret.) ARNYCE R. POCK, USAF, MC, DEPARTMENT OF MEDICINE

SUBJECT: Uniformed Services University (USU) Human Research Protections Program (HRPP) Determination of Not Research Involving Human Subjects for Protocol MED-83-9484

Protocol MED-83-9484, entitled "Post Carnegie II Curricular Reform: Emerging National and International Trends" was reviewed on May 01, 2018 by the Uniformed Services University's Human Research Protections Program Office and determined not to meet the criteria defining research involving human subjects at 32 CFR 219.102, and applicable DoD policy guidance. As such, this protocol does not require Institutional Review Board (IRB) review.

The aims of this MHPE (Master of Health Professions Education) thesis project are to identify, share, and promulgate some of most creative and/or innovative practices in curricular revision that may have emerged since the release of the second Carnegie report; and to highlight some of the similarities and differences associated with curricular revision in the international community. Deans and Associate Deans for Education from North American and European Medical schools, as well as from Military Medical Schools who attended the 2017 International Conference of Military Medical Schools will be asked to complete online survey related to curriculum reform that has occurred at their school.

Note, as this project appears to involve an information collection, it is your responsibility to ensure OMB clearance is, if necessary, obtained. Please use the provided pre-coordination sheet to assist with this determination. Project activities cannot commence until this clearance, if needed, has been obtained.

Also note, it is your responsibility to ensure approval, as appropriate, from the USU Office of International Affairs and Collaborations is obtained prior to initiation of research activities.

Should your project data sources, personnel, or methodology change, please contact this office before you begin any new phase of your work so that we may review it with you. Otherwise, we cannot ensure you will be incompliance with all applicable human subject research regulations. The IRB/HRPPO staff is a key resource that is available to assist you to ensure you are in compliance with applicable human research regulations.

If you have questions regarding this action, or questions of a more general nature concerning human participation in research, please contact the undersigned at 301-295-0819 or micah.stretch@usuhs.edu

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STRETCH Digitally signed by

[redacted]

Micah R. Stretch, M.A., J.D.,
Senior IRB Coordinator
Exemption Determination Official

Appendix 2: Sample Cover Message (North American Survey):

Dear Medical School Colleague;

Ever since the release of the 2010 Carnegie Foundation report, "*Educating Physicians: A Call for Reform of Medical Schools and Residency*," medical schools have been engaged in a wide range of creative and innovative curricular revisions. As such, I'd like to invite you to represent your school by participating in a brief survey focusing on some of the curricular changes that have taken place in North American medical schools over the past 10 years.

This survey is being conducted as part of an academic research project and has been reviewed by the Uniformed Services University (USU) Institutional Review Board (IRB), and found to be IRB exempt.

While participation is completely voluntary, my goal is to be able to highlight many of the unique and/or creative curricular innovations that are taking place in North American medical schools in a subsequent publication.

If there is someone else in your institution who might be better equipped to assist with this brief survey, please feel free to forward the survey link to them. Or, you can send me a short note and I'll be glad to send a separate message to whoever you designate.

In any event, if you have any questions about this survey please feel free to let me know. I can be contacted by email at Arnyce.pock@usuhs.edu or by phone at 301-295-9945.

With thanks in advance,
Dr. Arnyce Pock

{Link to Survey}

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Appendix 3: Survey for U.S & Canadian Medical Schools
(Microsoft Word Version)

1. What is the name & location of your medical school? _____

2. Do you have a dedicated, pre-clinical, basic science curriculum? (e.g Are students required to complete a period of study focused on the basic sciences—anatomy, physiology, pathology, microbiology, immunology, etc prior to doing their full time, clinical rotations?)
   - ○ Yes (proceed to next question)
   - ○ No (skip to question 5)

3. What is the duration, in months, of your standard, pre-clinical (basic science) curriculum?
   ____ months

4. How is your pre-clinical curriculum organized? Please check all that apply.
   - ○ Organ-system based (ex: a cardiopulmonary unit, musculoskeletal unit, etc)
   - ○ Departmentally/Discipline focused (ex: Anatomy, Physiology, Biochemistry, etc)
   - ○ Review of Normal Development followed by Abnormal Development/Disease States?
   - ○ Other (please specify) _____

5. What are the three (3) most significant curricular changes that your medical school has undertaken within the past 10 years? Please explain why each of these changes were significant.

_____
_____

6. Were any of these changes included as part of a major curricular revision/restructuring? If yes, when were they implemented?

_____
_____

7. What were the most significant challenges, if any, that you or your program encountered when contemplating any of these changes?

_____
_____

8. Does your current or revised curriculum have a name? If yes, what is it, and why did you choose it?

_____
_____

9. What are the top three (3) curricular innovations or educational approaches that your school is most proud of? And why?

_____
_____

10. Does your curriculum include any of the following? Please check all that apply:

- A Longitudinal Integrated Curriculum?
- Opportunities for Early (within the first 12 months of medical school) Clinical Participation?
- Reflective writing?
- Leadership training?
- Inter-Professional Education?
- Team based learning?
- Opportunities for students to participate in Quality Improvement/Patient Safety related projects?
- Opportunities for students to participate in a Clinical or Bench research-based project of their choosing?
- Opportunities for individual students to advance in their training, ahead of their peers, if they are able to demonstrate that they have already attained a specific skill or knowledge level?

Please explain why your school chose to implement the items that were checked:

_____
_____

11. In what year did your school admit its first Class of medical students? _____

12. Do you have a picture or chart that describes what your curriculum looks like?
If so, could you email us a copy—or provide a link to the corresponding website?
{Contact information to be inserted here}

13. Is there anything else that you would like to tell us about your school or your medical school curriculum?

_____
_____

14. May we contact you for a brief, follow-up, phone interview to discuss some of your answers?

a. Yes
   i. Daytime phone #: _____
   ii. Email: _____

b. No thanks.

Appendix 4: Demographics of Responding Schools

Note: Geographic regions pertain to those defined by the U.S Census Bureau

Northeastern Respondents (N=9 of 34 LCME Accredited Schools in Region)	Date of Initial LCME Accreditation[2]	Type of School
Cooper Medical School of Rowan University, NJ	2011	Public
Albert Einstein College of Medicine, NY	1955	Private
Penn State College of Medicine, PA	1967	State-Related
Lewis Katz School of Medicine at Temple University, PA	On or prior to 1942	State-Related
Columbia University Vagelos College of Physicians and Surgeons, NY	On or prior to 1942	Private
New York University School of Medicine, NY	On or prior to 1942	Private
Yale School of Medicine, CT	On or prior to 1942	Private
Sidney Kimmel Medical College at Thomas Jefferson University, PA	On or prior to 1942	Private
Warren Alpert Medical School of Brown University, RI	1963	Private

Midwestern Respondents (N=12 of 34 LCME Accredited Schools in Region)	Date of Initial LCME Accreditation	Type of School
Northwestern University Feinberg School of Medicine, IL	On or prior to 1942	Private
University of Wisconsin School of Medicine and Public Health, WI	On or prior to 1942	Public
Oakland University William Beaumont School of Medicine, MI	2010	Public
Michigan State University College of Human Medicine, MI	1964	Public
University of Missouri-Columbia School of Medicine, MO	On or prior to 1942	Public

[2] The LCME was established in 1942. The first accreditation was awarded in 1943.

Case Western Reserve University School of Medicine, OH	On or prior to 1942	Private
Southern Illinois University School of Medicine, IL	1972	Public
Chicago Medical School at Rosalind Franklin University of Medicine and Science, IL	On or prior to 1942	Private
Central Michigan University College of Medicine, MI	2012	Public
Boonshoft School of Medicine Wright State University, OH	1976	Public
Washington University in St. Louis School of Medicine, MO	On or prior to 1942	Private
University of Kansas School of Medicine, KS	On or prior to 1942	Public

Southern Respondents (N=24 of 54 LCME Accredited Schools in Region)	**Date of Initial LCME Accreditation**	**Type of School**
Florida State University College of Medicine, FL	2002	Public
George Washington University, DC	On or prior to 1942	Private
Texas Tech University Health Sciences Center School of Medicine, TX	1971	Public
Morehouse School of Medicine, GA	1978	Private
University of Tennessee Health Science Center College of Medicine, TN	On or prior to 1942	Public
Marshall University Joan C. Edwards School of Medicine, WV	1977	Public
Baylor College of Medicine, TX	On or prior to 1942	Private
University of Texas at Austin, Dell Medical School, TX (provisional accreditation, 2015)	2015	Public
East Tennessee State James H. Quillen College of Medicine, TN	1978	Public
University of South Alabama College of Medicine, AL	1972	Public
The University of Texas Health Science Center at San Antonio Joe R. and Teresa Lozano Long School of Medicine, TX	1968	Public

University of South Carolina School of Medicine, Columbia, SC	1976	Public
Howard University College of Medicine, DC	On or prior to 1942	Private
University of Florida College of Medicine, FL	1958	Public
University of Kentucky College of Medicine, KY	1960	Public
University of Louisville, School of Medicine, KY	On or prior to 1942	Public
University of Mississippi School of Medicine, MS	On or prior to 1942	Public
The University of Texas Southwestern Medical School, TX	1943	Public
Virginia Tech Carilion School of Medicine, VA	2009	Private
Wake Forest School of Medicine of Wake Forest Baptist Medical Center, NC	On or prior to 1942	Private
Charles E. Schmidt College of Medicine at Florida Atlantic University, FL	2011	Public
Georgetown University School of Medicine, DC	1949	Private
Paul L. Foster School of Medicine Texas Tech University Health Sciences Center, TX	2008	Public
Virginia Commonwealth University School of Medicine, VA	On or prior to 1942	Public

Western Respondents **(N=3 of 21 LCME Accredited Schools in Region)**	**Date of Initial LCME Accreditation**	**Type of School**
University of California, Davis School of Medicine, CA	1967	Public
Oregon Health & Science University School of Medicine, OR	On or prior to 1942	Public
California Northstate University College of Medicine, CA (preliminary accreditation, 2015)	2015	Private

Puerto Rican Respondents **(N=2 of 4 LCME Accredited Schools in this Commonwealth)**	**Date of Initial LCME Accreditation**	**Type of School**
University of Puerto Rico School of Medicine, PR	1954	Public

San Juan Bautista School of Medicine	2007	Private

Canadian Respondents (N=2 of 17 LCME Accredited Schools)	**Date of Initial LCME Accreditation**
University of Alberta Faculty of Medicine and Dentistry, Canada	1936
University of Toronto Faculty of Medicine	1935

Appendix 5: Profile of Survey Responses Based on Duration of LCME Accreditation

Time Frame of Initial, Full LCME Accreditation	**Number of Identifiable Respondents (N=52)**	**Percent of Total Survey Responses with Full LCME Accreditation (N=50)**	**Number and Percent of North American Schools with Full LCME Accreditation (N=158)**
On or Prior to 1942 "Old Schools"	23	46%	(83) 52.6%
1943-1973 "Established Schools"	14	28%	(44) 27.8%
1974-2004 "Relatively New Schools"	6	12%	(15) 9.5%
2005+ "New Schools"	7*	14%	(16) 10.1%

*Excludes 2 new schools who responded, but that are currently holding provisional or preliminary LCME accreditation

Appendix 6: Schools Self-Identified as Not Having a Standard Pre-Clerkship Curriculum

Medical School	Summarization of Web-Based Description of their Pre-Clinical Curriculum	Corresponding Web Page & Curricular Name (if applicable)
Virginia Commonwealth University School of Medicine	First year described as being devoted to "Scientific Foundations of Medicine," focusing on structure, function, and pathophysiology of differing organ systems.	https://medschool.vcu.edu/education/md-program/ (C^3 Curriculum)
University of Kentucky School of Medicine	First 19 months focus on foundational principles of basic sciences along with a ongoing (parallel) type introduction to basic diagnosis and management strategies.	http://meded.med.uky.edu/curriculum-overview (Kentucky Integrated Curriculum)
Sidney Kimmel Medical College	21 month, Foundations of Medicine program; integrating basic, clinical and health systems science concepts in a series of organ-system based units, each of which are 3-14 weeks in duration.	https://www.jefferson.edu/university/skmc/md-curriculum/courses/Foundations-of-Medicine.html (JeffMD Curriculum)
Southern Illinois School of Medicine	Emphasis on small groups using case-based learning, with approximately 1/3 of first year spent in clinical environments; MS-II year continues with a series of "multidisciplinary rotations of case-based, small group learning units that emphasize the basic sciences in a clinical context."	http://www.siumed.edu/oec/about-office-education-and-curriculum-oec.html-0
Michigan State University	Early & middle clinical immersions followed by core/foundational/specialized intersessions; key aspect is that curriculum follows clinical experience.	https://curriculum.chm.msu.edu/curricular-content/overview (Shared Discovery Curriculum)
Dell Medical School	12-month (Essentials) program includes integrated, longitudinal threads focusing on basic sciences, inter-professional education, leadership & clinical skills. Emphasis on case and problem-based learning, using blend of large and small groups.	https://dellmed.utexas.edu/education/academics/undergraduate-medical-education/leading-edge-curriculum (Leading EDGE Curriculum)
Oakland University William Beaumont School of Medicine	Organ-system oriented preclinical curriculum integrated with longitudinal instruction focusing on "the art and	https://www.oakland.edu/medicine/curriculum/about/

	practice of medicine, medical humanities and clinical bioethics, the promotion and maintenance of health and personal and professional development."	
Northwestern University Feinberg School of Medicine	Four key elements (Science in Medicine, Clinical Medicine, Professional Development, and Health & Society) integrated throughout all three phases of the four-year curriculum.	https://www.feinberg.northwestern.edu/md-education/curriculum/index.html
University of South Alabama	Described as a competency-based curriculum, with first two years utilizing an organ-systems type approach with integration of clinical medicine throughout.	https://www.southalabama.edu/colleges/com/com-bulletin/curriculum-description.html

Appendix 7: Medical Schools That Have Moved the USMLE Step 1 Examination to After Core Clerkships

Table Extracted from: "*Challenges associated with delaying administration of the United States Medical Licensing Examination (USMLE) Step 1 to after the core clerkships and how to approach them"*
Authored by: Arnyce Pock, MD, Michelle Daniel, MD, MHPE, Sally A Santen, MD, PhD, Aubrie Swan-Sein, PhD, EdM, Amy Fleming, MD, MHPE and Vicky Harnik, PhD Manuscript submitted to and accepted for publication by *Academic Medicine* (November 2018)

Medical School	Year Moved[a]
Duke University School of Medicine	1992
Perelman School of Medicine at the University of Pennsylvania	2000
Baylor College of Medicine	2004
New York University School of Medicine	2013
Uniformed Services University of the Health Sciences	2014
Vanderbilt University School of Medicine	2015
Columbia University Roy and Diana Vagelos College of Physicians and Surgeons	2016
Florida International University Herbert Wertheim College of Medicine	2016
Western Michigan University Homer Stryker M.D. School of Medicine	2016
Frank H. Netter M.D. School of Medicine at Quinnipiac University[b]	2017
Harvard Medical School	2017
Weill Cornell Medical College[c]	2017
Dell Medical School at the University of Texas at Austin	2018
Stony Brook University School of Medicine[d]	2018
University of Michigan Medical School	2018
Yale School of Medicine	2018
Pennsylvania State University College of Medicine	2019
University of Wisconsin School of Medicine and Public Health	2019

Abbreviation: USMLE indicates United States Medical Licensing Examination.
[a]Academic year that the shift was made.
[b]Made Step 1 a rotating clerkship block.
[c] Made the timing of the exam optional for 1/3 of class in 2018
[d]100% of class planned for 2019.

Appendix 8: New Curricular and Assessment Characteristics of Five Schools

Table Extracted from: "*Challenges associated with delaying administration of the United States Medical Licensing Examination (USMLE) Step 1 to after the core clerkships and how to approach them"*

Authored by: Arnyce Pock, MD, Michelle Daniel, MD, MHPE, Sally A Santen, MD, PhD, Aubrie Swan-Sein, PhD, EdM, Amy Fleming, MD, MHPE and Vicky Harnik, PhD Manuscript submitted to and accepted for publication by *Academic Medicine* (November 2018)

	School 1	School 2	School 3	School 4	School 5
Class size	120/year	172/year	100/year	150/year	170/year
Length of pre-clerkship curriculum	60 weeks	57 weeks	49 weeks	57 weeks	48 weeks
Length of M1 summer	9 weeks	6 weeks	4 weeks	11 weeks	6 weeks
Normal & abnormal (e.g. physiology & pathophysiology) are taught in integrated organ systems	Yes	Yes	Yes	Yes	Yes
Pre-clerkship grades	Pass / Fail	Honors / Pass / Fail	Pass / Fail	Pass / Fail	Pass / Fail
Types of pre-clerkship knowledge assessments	Faculty developed MCQs	Faculty developed MCQs	Faculty developed essay, short answer	Faculty developed MCQs	Faculty developed MCQs
Use of Pre-clerkship NBME exams	None	Customized basic science NBME exams as	Customized basic science NBME exams	None	Customized basic science NBME exams;

		basis for midterm and final exams; CBSSA at start of Step 1 study period;			CBSE as progress test with passing threshold
Start of Clerkships	January of M2	January of M2	September start of M2	January of M2	October of M2
Length of clerkship curriculum	48 weeks Jan - Dec	48 weeks Jan - Dec	41 weeks Sept - Aug	48 weeks Jan - Dec	48 weeks Oct - Sept
Science integration in the clerkships	One-week science intensives, online modules, four-week selectives	Spaced education, distance learning, small groups, journal clubs	One week intensive, six one day basic science sessions	Clerkship specific integration strategies	Weekly science ½ day small group sessions; four week applied science clerkship
Clerkship NBME exams	Clinical subject NBME exams (internal medicine, surgery, psychiatry, pediatrics, obstetrics and gynecology, and neurology)	Clinical subject NBME exams (internal medicine, surgery, psychiatry, pediatrics, family medicine, obstetrics/gynecology, emergency medicine)	Clinical subject NBME exams (internal medicine, surgery, psychiatry, pediatrics, obstetrics /gynecology, and neurology)	Clinical subject NBME exams (internal medicine, surgery, family medicine or adult ambulatory, psychiatry, pediatrics, obstetrics /gynecology, neurology)	Clinical subject NBME exams (internal medicine, surgery, family medicine, psychiatry, pediatrics, obstetrics and gynecology) and faculty developed MCQ exam (neurology)
Clerkship Grades	H, HP, P, F	H, P, F	P, F	H, HP, P, F	H, HP, P, F
Contribution of Clinical Subject Exam Score to Clerkship Grade	10% for all clerkships	20-33%	20% for all clerkships	Range 5-15%;	Range 20 – 40%
Step 1 study period	5-6 weeks*	6 weeks*	6 weeks*	8 weeks*	6-8 weeks

*****More if vacation time is used; MCQ: multiple choice question, NBME: National Board of Medical Examiners; CBSE: Comprehensive Basic Science Exam