

Transition from Undergraduate to Postgraduate Medical Education: A Scoping Review

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THESIS

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SUMMARY

The purpose of this scoping review was to explore the published literature and identify potential future educational research questions and activities regarding senior year curriculum in United States (U.S.) medical schools. In particular, we focus on the transition between final year of medical school and residency, identifying trends in competency-based practices. A structured, five-step approach was used to conduct this scoping review. Electronic searches of PubMed, ERIC, Scopus, MedEdPortal and eight medical education journals were conducted to identify relevant articles published in 2006-2017.

Among 6,485 articles retrieved, 817 articles were included in the study. From 2007-2011 to 2012-2016, articles addressing the final year of medical school increased 93%, whereas articles describing internship preparatory courses increased 218%. While the majority of articles did not use a competency-based medical education (CBME) framework (572/817, 70%), the frequency of its description increased 268% from 2007-2011 to 2012-2016. Nearly three-quarters of preparatory course-related papers included use of or direct reference to a CBME framework (37/50, 74%). Most of articles did not associate with a single discipline (481/817; 59%).

This scoping review identified substantial increase in recent publications on the final year and transition between medical school and residency. These results reflect a recent curricular paradigm shift in medical education from a traditional to competency-based education model.

I. INTRODUCTION

The educational value of the final year (fourth year in a four year curriculum) of medical school has been discussed in the medical education literature for more than four decades.¹ In the U.S., the final year of undergraduate medical education (UGME) has been described as unstructured, sometimes lacking clear goals and objectives, and as a period of unfulfilled potential.²⁻⁴ With the implementation of the Accreditation Council for Graduate Medical Education (ACGME) Milestones and the Association of American Medical Colleges (AAMC) Core Entrustable Professional Activities (EPAs) for Entering Residency, there has been even more scrutiny of the final year as specific expectations of graduates have been acknowledged. However, medical educators struggle with how to best integrate the competencies into medical training in a useful, practical and meaningful way.^{5,6} While many medical schools have embraced and adopted ACGME competencies⁷, most have not adapted the use of Milestones. Few educators have sought to further define and extend Milestones into UGME.⁸⁻¹⁰ A lack of integration of the competencies across the educational continuum has been identified as an important barrier to their optimal implementation and use.¹¹

ACGME Milestones include five levels of progression ranging from a beginning learner to an aspirational level of development. “Level 1” Milestones are designed to correspond to the expected level of competency of graduating students. The creation of specific competencies has provided more evidence that medical school graduates are not meeting expectations upon starting residency training.¹²⁻¹⁵ The 13 Core EPAs were introduced in 2014 to help “demonstrate improvement in the gap between performance

and expectations for students entering residency”.¹² Concerns also exist regarding a deficit in performance of the 13 Core EPAs at the completion of medical school.¹⁶⁻¹⁹

In response to these and other forces, many medical schools have developed senior year internship preparatory courses or transitional curricula.²⁰⁻³³ Newly graduated physicians often have deficits in organizational skills, medical knowledge, professionalism, and the ability to self-reflect, all while attempting to fill new and challenging roles.¹⁶ Interns report not feeling prepared to fulfill common clinical and professional responsibilities.²¹ In addition, transitions within medical training, particularly the transition from medical student to intern, are inherently stressful periods for trainees.³⁴ Difficulty with educational transitions has been associated with important negative sequelae, including the delivery of substandard patient care, and stress and physician burnout, as well as mental health problems.³⁵ Senior year curriculum, such as internship preparatory or transition courses, may ease the transition from student to resident physician.²⁰ In addition, incorporating competencies into the UGME curriculum, such as preparatory courses, may contribute to a more seamless and efficacious transition across the medical education continuum.^{36,37}

The expectation and competence level on the first day of residency training is enormous, and consequently the accountability of addressing the transition to graduate medical education is under scrutiny. In considering the design of senior year curriculum and the role of internship preparatory courses, we undertook a scoping review to explore and describe the current literature regarding the senior year curricula in U.S. medical schools in the era of competency-based developmental education and outcomes. A scoping review is an appropriate method of research given the breadth and diversity of

articles regarding the final year of medical school.

II. METHODS

We employed the scoping review methodology based on the framework suggested by Arksey and O'Malley³⁸ with subsequent recommendations proposed by Levac and others.³⁹⁻⁴¹ This scoping review followed five phases: (1) identifying the research question; (2) identifying relevant studies; (3) selecting studies; (4) charting data; and (5) collating, summarizing, and reporting the results.³⁹

Research questions

The authors purposefully kept the research question wide-ranging to examine the extent, range, and nature of published literature regarding the senior year of medical school.³⁸ The goal was to identify key concepts and map the literature in order to envision future practice and research in medical education.⁴² Scoping reviews offer a wide perspective of the literature⁴⁰ that may lead to a “deeper dive” in the form of subsequent systematic reviews. We refined our questions during several research meetings to the following:

1. What scholarship is being published regarding senior year curriculum in U.S. medical schools?
2. To what extent are schools describing the use of preparatory courses in the age of competency-based medical education?

Because published literature designed to address the final year and transition to residency may present in various forms, we determined appropriate search terms and parameters. As our familiarity with the literature increased, our research team redefined search terms and undertook more inclusive searches of the literature.³⁸ Researchers were required to

engage with each stage in a reflexive way and, where necessary, to repeat steps to ensure that the literature was covered in a comprehensive manner.³⁸

Identifying relevant articles

The primary author (CG) and a medical librarian performed the initial search in February 2017. The database searches were completed with finalized search terms in May 2017. We chose to search from 2006 to the present date in order to study the literature during the introduction of AAMC EPAs and implementation of ACGME Milestones. The refined search utilized PubMed, ERIC, Scopus, MedEdPortal and eight well-known medical education journals in order to conduct a comprehensive and broad review. The search query consisted of terms considered by the co-investigators to describe and capture all literature regarding the senior year of medical school. An iterative approach that involved performance of multiple pilot searches was utilized to reach consensus regarding final search terms that were inclusive and captured relevant literature.

The final search terms included “medical education”, “medical student”, “fourth year”, “final year”, “senior year”, “transition course”, “capstone”, “boot camp”, “bootcamp”, “milestone”, or “entrustable professional activity”. (Appendix 1) Reference lists of included articles were searched by hand to identify additional articles for consideration.

Selecting studies for review

Study selection involved a screening process to determine the relevance of articles to the research question. Eligible articles were therefore required to involve: the (1)

final year of a (2) United States (3) medical school. Articles were excluded if they reported on a non-U.S. medical school focus or did not involve the final year. Final inclusion and exclusion criteria were devised *post hoc*, based on increasing familiarity with the literature, and were then applied to all the citations to determine their relevance. (CC) Additional exclusion criteria included articles focused on the residency match process (rather than career exploration), articles written in reply to previous publications, and textbook chapters.

A screening tool was developed by all authors using by a comparative process to ensure reliability in article selection. Authors independently piloted the screening tool, allowing for calibration of search terms prior to proceeding to independent screening or extraction. The primary author (CG) independently reviewed all titles and abstracts for eligibility using the screening instrument. Three co-investigators (AT, YP, TS) also reviewed 50 randomly selected articles using the screening tool in order to determine agreement of article inclusion. Any disagreements were resolved following complete article review and discussion until consensus was reached.

Endnote X7.4 (Thomas Reuters, New York, NY) was used to import all citations from the databases and journals. Duplicate citations were removed manually.

Charting the data

Investigators developed a data collection form to extract variables from the full text records in order to address our research question. Creation of categories was an iterative process including multiple meetings with co-investigators and consensus building to agree upon common themes and categories. Given the number and breadth of

articles, our research team sought to identify information in a spreadsheet that could be reliably categorized from a large scoping search.

Data categories included: author, year of publication, domain (curriculum, instruction, assessment, evaluation, or other), article category (research paper, review article, special feature, short report, or other), research method (descriptive, qualitative, quantitative, or mixed-methods), educational measure (knowledge, skills, attitudes, or N/A), learner characteristics (final year only, other UME, GME, faculty, or other), focus of article (preparatory courses, inter-professional education, development of clinical skills, career choice, or other), use of a competency-based framework, use of simulation, and discipline (if applicable). All investigators piloted the data collection form by each extracting data independently until the final data categories were agreed upon.

(Appendix 2) This decision was based on independent pilots, multiple meetings and discussions, and achievement of agreement through article review. The high degree of consistency between our extracted data sets supported the utility of the final data collection form.

Using the final refined collection form, the primary author (CG) revisited all articles to extract data. Data-charting was also performed independently by the three co-investigators who each reviewed 50 randomly selected articles using the same extraction form. Any disagreements were again resolved through complete article review and discussion until consensus was reached.

Collating, summarizing, and reporting findings

Two authors (CG and TS) analyzed the extracted data using numerical

description. After discussions among the research team, we finalized the data summaries based upon our research questions. Interrater agreement was calculated using Cohen's kappa (κ).

This study was approved by the institutional review boards at Maine Medical Center and the University of Illinois at Chicago.

III. RESULTS

Our database and journal searches retrieved a total of 6,477 records and, after removing duplicates, 4,051 articles remained. We then screened all titles and abstracts and excluded 3,242 records based on our eligibility and inclusion criteria leaving 809 articles. Hand searching of included article references yielded an additional 8 articles. (Figure 1) Initial agreement on study inclusion was moderate to strong with $\kappa = 0.70$ (rater pair 1), $\kappa = 0.73$ (rater pair 2), and $\kappa = 0.90$ (rater pair 3). A total of 817 articles met our criteria and were included in our final review. Our agreement for individual categories using the charting instrument ranged from $\kappa = 0.77$ to 1.00. (Appendix 3)

The ensuing sections present our findings, categorized by research question.

Research Question 1: What scholarship is being published regarding senior year curriculum in US medical schools?

Basic characteristics and article topics. There was a large increase in the number of published articles relevant to the final year curriculum from the years 2006 through 2017. Using the most recent comparators over 5 years intervals, the number of articles increased 93% from 2007-2011 ($n = 255$) to 2012-2016 ($n = 493$). (Figure 2) Articles focusing only on the final year have also increased by 72% within the same time frame. ($n = 105$ to 181).

Of 817 inclusive articles, 758 (93%) were research papers, 21 (2.5%) were review articles, 12 (1.5%) were special features or short reports, and 26 (3%) were classified as 'other'. Research articles were defined as those containing investigation aimed at discovery of a tangible product of new knowledge and included student assessment and

course evaluations. Other includes commentaries, perspective, or editorials.

The majority of articles included were focused on a specific curriculum (420/817, 51%). For example, one article described a curriculum focused on enhancing learners' skills in caring for cancer survivors. Others discussed assessment technique (101/817, 12%), instructional method (85/817, 10%), or program evaluation (19/817, 2%). A total of 192 articles (24%) were not categorized into one of these defined domains. Examples of "other" included perspective or opinion-based articles or studies that did not specifically focus on a curriculum, assessment measures, instructional methods, or program evaluation.

Article 'focus' categories included: clinical skills, preparatory courses, career choices, inter-professional education (IPE), and other. Clinical skills include procedural skills and interpersonal skills such as communication and professionalism. Sixty-seven percent (547/817) of articles studied or described the use of clinical skills during the final year. Internship preparatory courses were described in 6% (50/817) of papers. Another 6% (47/817) of papers focused on students' career decision-making while IPE was described in only 4.5% (37/817) of included articles. Thirty-eight percent of studies (308/817) were categorized as 'other,' including topics such as curricular programming, learning environment, mentorship, professional identity, and student scholarship.

Articles were examined for the use of simulation, including task trainers, standardized patients, procedure or cadaver laboratories, and objective structured clinical examinations. Most included studies did not describe the use of simulation (627/817, 77%). However, the number of articles involving the use of simulation increased over

100% from 2007-2011 ($n = 52$) to 2012-2016 ($n = 117$).

Competency-Based Medical Education framework. We searched for specific evidence supporting the use of a CBME framework, including mention of ACGME Milestones, EPAs, or discussion of CBME. The majority of articles reviewed did not describe the use a competency-based framework (572/817, 70%). In addition, of articles focused only on the final year, most (246/317, 78%) did not use CBME language. However, the number of articles referencing the use of a competency-based framework increased 268% from 2007-2011 ($n = 47$) to 2012-2016 ($n = 173$). (Figure 2)

Research characteristics. The research methods employed in the included studies were most often quantitative (588/758, 78%). Descriptive or narrative approaches were the second most commonly observed methods, present in 21% of studies (161/758). Qualitative methods were not commonly used, identified in only 37 of 758 research articles (5%). Mixed methods studies were also infrequent, used in just 31 publications (4%).

The majority of articles (386/817, 47%) included an attitudinal outcome measure, such as students' attitudes towards HIV status disclosure or general attitudes towards a particular specialty. Knowledge and/or skills (136/817, 17%) and a combination of knowledge, skills and attitudinal data (142/817, 17%) were also frequently evaluated. A total of 153 articles (19%) did not utilize an outcome measure and largely corresponded to descriptive or narrative pieces.

Subjects and disciplines involved. Half of the articles included other years in undergraduate medical education inclusive of the final year (408/817, 50%). While 39%

(317/817) only focused on the final year, another 22% (181/817) also involved graduate medical education, extending to resident physicians or those in fellowship.

Approximately 9% (70/817) of studies included faculty and 46 (6%) involved other subjects such as medical school administration, nurses or nursing students, patients, and lay persons.

When a singular discipline was specified within a paper (336/817, 41%), fields included Surgery (69/336, 21%), Emergency Medicine (60/336, 18%), Pediatrics (33/336, 10%), Internal Medicine (26/336, 8%), Radiology (22/336, 7%), Geriatrics (17/336, 5%), Neurology (16/336, 5%), Obstetrics and Gynecology (15/336, 4%), Psychiatry (15/336, 4%), Orthopedics (11/336, 3%), and Family Medicine (10/336, 3%). The majority of articles did not associate with only one discipline (481/817; 59%).

Research Question 2: To what extent are schools describing the use of preparatory courses?

Basic characteristics and article topics. Our review identified 50 (6% of total) articles describing the use of preparatory courses. The number of published descriptions of transitional curricula has increased over time, with an average of 2.3 annual publications for the span from 2006 through 2011 and an average of 7.0 publications per year for the span from 2012 through 2016. (Figure 3) Using the most recent comparators over 5 years intervals, the number of articles increased 218% from 2007-2011 ($n = 11$) to 2012-2016 ($n = 35$). Almost all (49/50, 98%) of these articles were categorized as being research articles with one being a review article. The large majority of these papers (40/50, 80%) described preparatory curricula, 6% (3/50) were related to assessment, two

were related to instruction or instructional methods (4%), two articles were considered to be evaluative (4%), and three additional papers fell into other categories (6%). Fifty-two percent of articles described the use of at least one form of simulation (26/50).

Competency-Based Medical Education framework. Nearly three-quarters of preparatory course articles included use of or direct reference to a CBME framework (37/50, 74%).

Research characteristics. Eighty-four percent (42/50) of preparatory course papers were quantitative in nature and an additional 8% (4/50) used only descriptive methods. Consistent with the larger group of included papers, a small proportion used qualitative (1/50, 2%) or mixed methods (3/50, 6%). Outcomes for this subgroup of papers included a measure of knowledge, skills, and attitudes in 50% of cases (25/50) with an additional 8% (4/50) utilizing knowledge or skills-based outcome. Eighteen papers (36%) included only an attitudinally-based outcome, and the four descriptive papers did not include an outcome evaluation (8%).

Disciplines involved. Sixty-five percent of preparatory courses were concentrated on one discipline, including Surgery (20/50, 40%), Pediatrics (4/50, 8%), Internal Medicine (3/50, 6%), Emergency Medicine (2/50, 4%), Obstetrics and Gynecology (1/50, 2%), Geriatrics (1/50, 2%), and Pharmacology (1/50, 2%). Eighteen papers (36%) did not identify a specific discipline.

IV. DISCUSSION

This scoping review explored and mapped the literature regarding the senior year of U.S. medical school training. Arksey and O'Malley describe four reasons to perform a scoping study: to examine the extent, range, and nature of research activity; to determine the value of undertaking a full systematic review; to summarize and disseminate research findings; and to identify research gaps in the current literature.³⁸ Based upon the findings of our review of the literature, we offer the following observations and recommendations to enhance education and research related the senior year. We also discuss challenges, controversies and additional considerations related to the final year of medical school.

Value and structure of the final year

The potential value of the final year of medical school continues to be scrutinized and sometimes considered as inefficient and not optimized.⁴³⁻⁴⁷ Since 2006, our results show a substantial increase in the number of published articles relevant to the fourth year curriculum. While the majority of the literature is quantitative research articles describing specific curricula, this is accompanied by numerous calls for reform and specific recommendations for change.^{1,48-54} For example, one-hundred year after the Flexner report⁵⁵ the 2010 Carnegie Foundation report includes recommendations for standardization of learning outcomes and individualization of the learning process.⁴³ The increased amount of scholarship discovered in this review suggests an interest in escalating the educational value of the final year.

The programming and structure of the final year continues to be deliberated and

realigned with various strategic goals. Some authors argue for an elective and laissez-faire year, allowing for autonomy and individualization of the curriculum.^{47,56} They recognize that students have competing priorities including individual learner-centered needs, time for career exploration, and strategic and logistical pre-residency process concerns.^{4,47} Students value flexibility and individualization in a pursuit of personal interests and professional development.⁴⁷ Authors studying residents' perspectives on the final year advise: (1) specification of competencies and Milestones necessary for graduation, (2) individualization of learning plans and processes, and (3) accountability structures to facilitate achievement of required outcomes and personal goals.⁵⁷ Others recommend a more prescribed structure.^{3,4,16,56,58} In 2011, the Alliance for Clinical Education (ACE), made up of leaders from a broad range of medical specialties organizations, presented recommendations for redesigning the final year of medical school.³ In summary, ACE recommended that all students: (1) demonstrate progress towards mastery of the six ACGME Core Competencies, (2) complete a capstone course to prepare them for residency, (3) have specialty-specific objectives to prepare for residency, and (4) have a system for identifying and correcting gaps in knowledge and skills during the final year.³

CBME

Inadequate formative assessment and timely feedback is a recognized problem in medical education.⁵⁹ Through a CBME framework, the Milestones and Core EPAs have elevated the standardized method of assessment data and competency progression. Our results indicate a substantial increase in the use of CBME frameworks in UGME senior year curriculum research over the past 10 years confirming the trend toward competency-

based education. The utilization of transparent, criterion-based assessment and feedback should allow clear expectations for both the learner and the educator while affording greater flexibility in the learning process.^{3,43} Yet it is often unknown what the individual resident's baseline Milestone proficiency is when they enter residency training.¹³ Systematic competency assessment structures such as the GME clinical competency committee (CCC) do not exist in UGME. Likewise, although the AAMC created the EPAs as a standard for graduating students, this is not yet being uniformly assessed or reported.⁶⁰

While residency Program Directors have supported the communication of competency-based information during the transition from UGME to GME, no systematic summative performance assessment occurs near the completion of medical school.^{13,61} The current standard communication with residency programs has been the medical student performance evaluation (MSPE), which may be variable and incomplete.⁶² The MSPE is completed early in the fourth year and does not include assessment data regarding most of the final year curriculum. However, recent literature has demonstrated that the ACGME Milestone competencies can be assessed and communicated to residency programs for graduating medical students.^{9,14} Likewise, Milestone assessment could be performed during specialty-specific experiences, cumulative from various senior year experiences, and/or from senior year boot camps.^{9,13,14,29,30,63-65}

Preparatory courses

A natural first step in bridging the final year to residency is an introduction of a preparatory course. A proposed definition of a preparatory course, otherwise known as a

capstone course or boot camp, is a “focused course designed to enhance learning, orientation, and preparation for learners entering a new clinical role”.²⁵ This review found a substantial increase in the frequency of preparatory courses articles over the past 10 years. Most describe unique preparatory curriculum and include quantitative research methods such as knowledge or skills acquisition. Boot camps often vary by individual institution and commonly focus on improving learner confidence in knowledge, teamwork, procedural skills, and general patient care.²⁰⁻²⁷ A 2015 study reported that 59% of all LCME-accredited medical schools had a required capstone course.⁵⁸ Such courses have been reviewed very positively by participants and appear to improve confidence and performance of technical skills.^{21,23,24,27,31,33,66,67}

Preparatory courses may offer additional opportunity for advanced skill development when educational experiences with live patients occur randomly and with diminishing frequency.⁶⁸ Just over half of preparatory courses in our study report the use of simulation. Placing such a course at the conclusion of medical school offers the advantages of a familiar and safe learning environment while not being judged in a new role with greater likelihood of direct patient outcome. Although the timing and venue for assessment and feedback would be appropriate, not all courses in the final year are designed to allow an assessment of core competencies.^{9,14,20,29,30,63,64,65,69} Our review found 74% of (published) preparatory courses are using a competency-based framework. However, most information about curricular outcomes in the fourth year, including preparatory courses, likely remains unstudied or unpublished.^{1,3}

Given discipline-specific competencies, there are also a growing number of specialty-specific boot camps and senior year preparatory curricula.^{4,59,70-73} Over the past

decade, we found 65% of preparatory courses were concentrated on one discipline, with the surgical field accounting for the largest number. This may be due to the fact that more than 45 medical schools are now participating in a national standardized preparatory surgical internship curriculum.⁷¹ This curriculum was organized by the American College of Surgeons (ACS), the Association of Program Directors in Surgery (APDS), and the Association for Surgical Education (ASE) and supported by a multi-institutional needs assessment.²¹ A national standardized specialty-specific preparatory curriculum may uniformly address specific competencies, including Level 1 Milestones, and help equalize the knowledge and skills of students entering similar programs.³² Likewise, a local, regional, or national preparatory curriculum could be built upon the shared Milestones and/or Core EPA frameworks.^{12,74} A Milestone-based course may familiarize students with how they will be assessed in residency and provide a compass for competency progression.

Further considerations and recommendations

Common language. U.S. medical schools appear to be at early stages of a transformation in both UGME and GME curricula design. As medical schools embrace a competency-based education, they are now determining how best to utilize and implement these frameworks.⁷⁵ While residents are being assessed by predetermined Milestones, senior medical student assessments are still largely individualized by institution and are not currently focused on the competencies defined in residency. As with the challenges associated with a clinical ‘sign-out,’ medical educators must determine how we can optimize a safe and accurate transition of our learners from medical school to residency. Future work and partnerships are needed to cultivate

curricula that include valid assessment using a shared language to accomplish UGME curricular goals and offer up-to-date student data.⁷ Completion of UGME goals and summative assessment for an educational hand-off should be complimentary rather than mutually exclusive.

Transition from UGME to GME. Once identification and assessment of Milestones and EPAs occurs, medical schools will need to deliberate if, how, and when communication to residency programs occurs. Some argue that medical schools should take responsibility for providing residency programs updated and accurate competency-based assessment of graduates.^{9,65} Studies have supported the feasibility of Milestone-based, post-Match assessments and curricula preparing for transition to residency programs.⁹ A post-Match criterion-based assessment would fulfill the lack of competency-based information on incoming trainees and assist in ensuring a smooth educational transition.⁷⁶ In the future, standardization of this process may help provide students and their future educators (e.g. receiving program director and faculty) a chance to recognize, reflect, and act on ACGME Level 1 Milestone performance prior to starting in their new role. However, for medical schools and residency programs to successfully innovate, the funders, regulators, and professional organizations must be actively engaged in the reform effort.⁷⁷ Future research is needed to determine the best strategies and methods of concluding UGME and effectively bridge CBME framework into residency. This includes further studies regarding the efficacy and outcomes of competency-based preparatory courses and communication between UGME and GME educators.

Limitations

Given the wide scope of this study, we encountered significant variability among articles that prevented further specificity in categorization. In view of the large number of references in our initial screening, we elected not to explore the grey literature (dissertations, conference proceedings, etc.). Also, we did not complete the sixth step of a scoping review (i.e., consultation with stakeholders) as suggested by some authors,³⁹ but approximately 60% of prior scoping reviews do not include this step.⁴⁰

We chose to include all literature that involved the final year of medical school in order to avoid exclusion of content. Therefore, articles often contained shared curriculum or interventions with other medical education learners. This was purposeful, as the literature focused on this transitional period in training often includes other learners. The nature of a scoping review and our research questions is broad-reaching and therefore may not provide specific recommendations regarding senior year curriculum. Our scoping review lacks the specificity of a systematic review of the literature and is less likely to assess the quality of included studies.³⁸

V. CONCLUSIONS

This scoping review describes the current landscape of published literature on senior year curricula in U.S. medical schools, in light of recent paradigm shift toward CBME. The number of articles involving the final year increased over 93% from 2007-2011 to 2012-2016. Over the same time period, the number of articles describing preparatory course increased 218%. While the majority of articles did not use a CBME framework (70%), the frequency of its description increased over 268% from 2007-2011 to 2012-2016. Nearly three-quarters of preparatory course articles included use of or direct reference to a CBME framework. These findings reflect a movement in U.S. medical schools towards using shared assessment metrics and promotion of baseline competency of graduating medical students. Both specialty-specific and competency-shared preparatory courses have shown promise and may provide a means of using shared assessment metrics and achieving a baseline competency of graduating medical students to facilitate the smooth and educationally meaningful transition from UGME to GME.

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FIGURES

Figure 1: Flow diagram for scoping review process

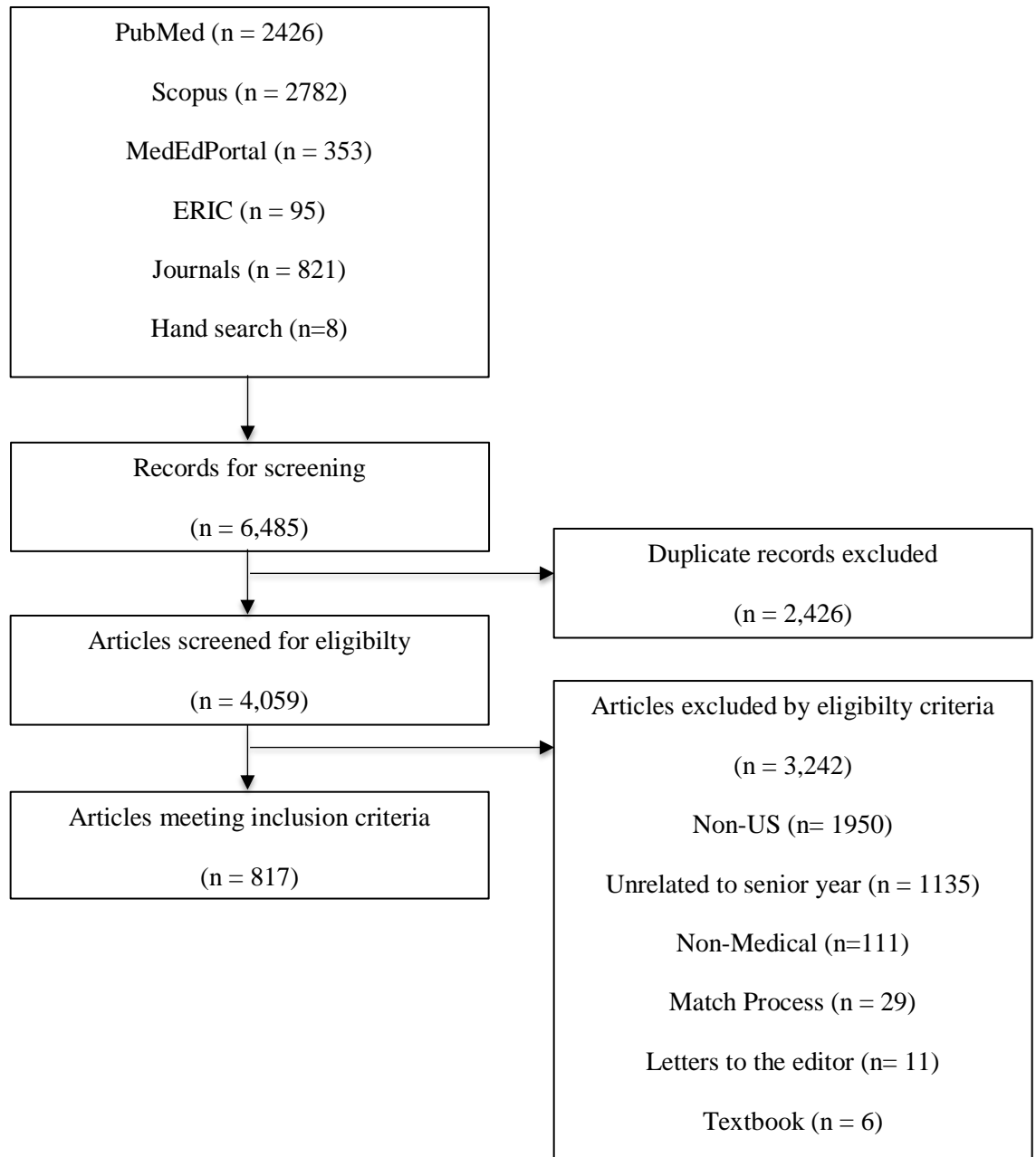
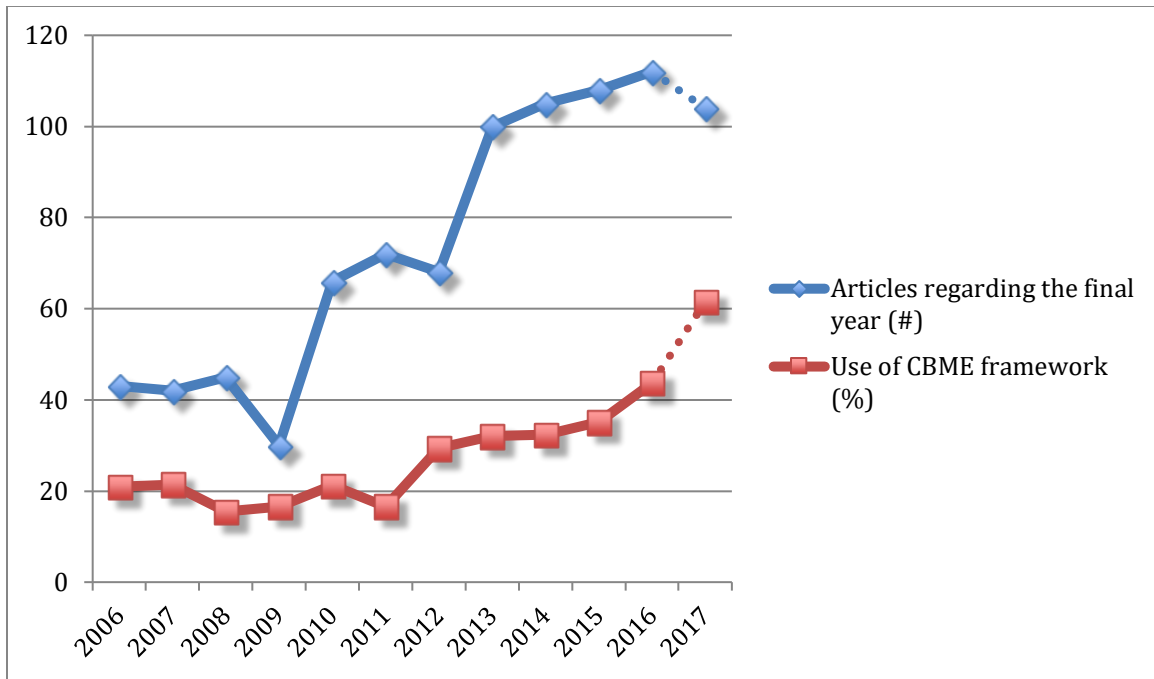


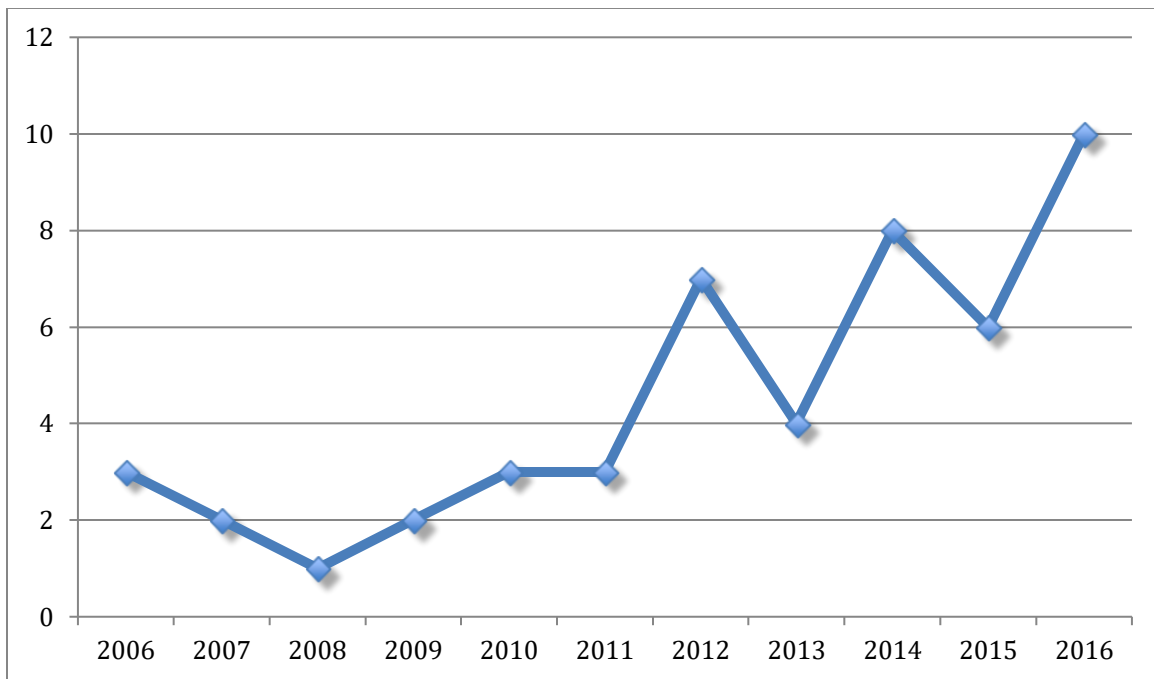
Figure 2: Use of Competency-Based Medical Education framework^{1,2}



Note:

1. X-axis represents Year of Publication. Y-axis shows the frequency (count).
2. 2017 data is incomplete and based upon initial results.

Figure 3: Frequency of articles on senior year preparatory courses¹



Note:

1. X-axis represents Year of Publication. Y-axis shows the frequency (count).

APPENDIX

Appendix 1: Search Strategy for a Scoping Review

Database	Search strategy – limited to 2006-2017	Results
PubMed	("medical education" OR medical student*) AND ("fourth year" OR "final year" OR "senior year" OR transition course* OR capstone* OR boot camp* OR bootcamp* OR milestone* OR entrustable professional activit*)	2426
ERIC	("medical education" OR medical student*) AND ("fourth year" OR "final year" OR "senior year" OR transition course* OR capstone* OR boot camp* OR bootcamp* OR milestone* OR entrustable professional activit*)	95
SCOPUS	("medical education" OR "medical student") AND TITLE-ABS-KEY ("fourth year" OR "final year" OR "senior year" OR "transition course" OR capstone OR "boot camp" OR bootcamp OR milestone OR “entrustable professional activit”)	2782
MedEdPortal	“fourth year" OR "final year" OR "senior year" OR “transition course” OR “capstone” OR “boot camp” OR “bootcamp” OR “milestone” OR “entrustable professional activity”	353
Medical Education	"fourth year" OR "final year" OR "senior year" OR "transition course" OR capstone OR "boot camp" OR bootcamp OR “milestone” OR "entrustable professional activity" OR "entrustable professional activities" (title, abstract, or keywords)	78
Journal of Graduate Medical Education	"fourth year" OR "final year" OR "senior year" OR "transition course" OR “capstone” OR "boot camp" OR bootcamp OR “milestone” OR "entrustable professional activity" OR "entrustable professional activities" (title, abstract, or keyword)	211
Academic Medicine	"Acad Med."[jour] AND ("fourth year" OR "final year" OR "senior year" OR transition course* OR capstone* OR boot camp* OR bootcamp* OR milestone* OR entrustable professional activit*)	245
Advances in Health Sciences Education	"Adv Health Sci Educ Theory Pract."[jour] AND ("fourth year" OR "final year" OR "senior year" OR transition course* OR capstone* OR boot camp* OR bootcamp* OR milestone* OR entrustable professional activit*)	26

Medical Teacher	"Med Teach."[jour] AND ("fourth year" OR "final year" OR "senior year" OR transition course* OR capstone* OR boot camp* OR bootcamp* OR milestone* OR entrustable professional activit*)	122
BMC Medical Education	"BMC Med Educ."[jour] AND ("fourth year" OR "final year" OR "senior year" OR transition course* OR capstone* OR boot camp* OR bootcamp* OR milestone* OR entrustable professional activit*)	114
Journal of Continuing Education in the Health Professions	"J Contin Educ Health Prof."[jour] AND ("fourth year" OR "final year" OR "senior year" OR transition course* OR capstone* OR boot camp* OR bootcamp* OR milestone* OR entrustable professional activit*)	4
Teaching and Learning in Medicine	"Teach Learn Med."[jour] AND ("fourth year" OR "final year" OR "senior year" OR transition course* OR capstone* OR boot camp* OR bootcamp* OR milestone* OR entrustable professional activit*)	21

Appendix 2: Data collection instrument categories

1. Author
2. Year
3. Title
4. Primary Domain
 - a. Curriculum
 - b. Instruction
 - c. Assessment
 - d. Evaluation
 - e. Other
5. Research Category
 - a. Research article
 - b. Review article
 - c. Special feature
 - d. Short report
 - e. Other (including Narrative, Commentary)
6. Research Methods
 - a. Quantitative
 - b. Qualitative
 - c. Mixed Methods
 - d. Descriptive/Narrative
7. Educational Measures
 - a. Knowledge or Skills
 - b. Knowledge/Skills and Attitudinal
 - c. Attitudinal
 - d. N/A
8. Article Focus
 - a. Clinical Skills
 - b. Preparatory Courses
 - c. Career Choice
 - d. IPE
 - e. Other
9. Competency-Based Framework (Y/N)
10. Non-Final Year learners
 - a. Final Year only
 - b. Other UME
 - c. GME
 - d. Faculty
 - e. Other
11. Simulation (Y/N)
12. Discipline
 - a. N/A
 - b. Anesthesia
 - c. Critical Care

- d. Dermatology
- e. EM
- f. FM
- g. Geriatrics
- h. IM
- i. Neurology
- j. OB/GYN
- k. Oncology
- l. Ophthalmology
- m. Orthopedics
- n. Otolaryngology
- o. Pathology
- p. Pediatrics
- q. Pharmacology
- r. Physical Medicine and Rehabilitation
- s. Psychiatry
- t. Radiology
- u. Surgery (including sub-specialties)
- v. Urology

13. Notes

Appendix 3: Initial paired review agreement findings^{1,2}

Data Element	Number Initial Disagreements (of 150 paired reviews)	Reviewer Pair A	Reviewer Pair B	Reviewer Pair C
		Initial Kappa	Initial Kappa	Initial Kappa
Author	0	1.00	1.00	1.00
Date	0	1.00	1.00	1.00
Title	0	1.00	1.00	1.00
Primary Domain	9	0.97	0.91	0.87
Research Category	3	1.00	1.00	0.83
Research Method	9	0.95	0.86	0.89
Educational Measures	6	0.97	1.00	0.85
Primary Focus	16	0.91	0.82	0.85
Use of CBME	6	1.00	0.77	0.79
Learner Types	10	0.94	0.87	0.88
Use of Simulation	5	0.86	0.89	0.95
Discipline	8	0.92	0.91	0.92

Note:

1. One investigator reviewed all articles to extract data using the data collection instrument.
2. Three co-investigators reviewed 50 randomly selected articles using the same extraction form.

VITA

FULL NAME AND DEGREE: Carl August Germann, MD, FACEP

CURRENT ADMINISTRATIVE TITLE:

Director of Orientation, EBM and 4th Year, TUSM-MMC Program, Department of Medical Education at Maine Medical Center

Core Academic Faculty and Assistant Program Director, Department of Emergency Medicine at Maine Medical Center

OFFICE ADDRESS : Department of Medical Education, 335 Brighton Avenue, Portland, Maine 04102

OFFICE PHONE NUMBER: (207) 662-8766

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FAX ADDRESS: (207) 662-7066

EDUCATION

Undergraduate

<i>Year of Degree</i>	<i>Degree</i>	<i>Institution</i>
1997	BS/ Biochemistry	University of Illinois

Medical School and/or Graduate School

<i>Year of Degree</i>	<i>Degree</i>	<i>Institution</i>
2002	Doctor of Medicine	University of Illinois

POSTDOCTORAL TRAINING

Internship and Residencies:

2002-2005	Resident Physician	Emergency Medicine	Maine Medical Center
2008-2009	Maine Health Physician Leadership Development Fellowship		

LICENSURE AND CERTIFICATION

2005-present	Maine Licensure #016681
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2005-present	Advanced Pediatric Life Support (APLS)
2005-present	Advanced Cardiac Life Support (ACLS)
2005-present	Advanced Trauma Life Support (ATLS)

ACADEMIC APPOINTMENTS

Date, Title, Institution

2015-present	Associate Professor	Tufts University School of Medicine
2009-2015	Assistant Professor	Tufts University School of Medicine
2008-2009	Assistant Professor	University of Vermont College of Medicine
2005-2008	Clinical Instructor	University of Vermont College of Medicine

HOSPITAL APPOINTMENTS

Date, Title, Institution

August 2013-Present	Attending Physician	Blue Hill Memorial Hospital
June 2009-2017	Attending Physician	Downeast Community Hospital
March 2008-April 2011	Attending Physician	York Hospital
Aug 2005-Oct 2011	Attending Physician	Parkview Hospital
July 2005-Jan 2010	Attending Physician	Rumford Hospital
June 2005-Jan 2010	Attending Physician	Bridgton Hospital
July 2005-Jan 2010	Attending Physician	Central Maine Medical Center
June 2005-Present	Attending Physician	Maine Medical Center
Jan 2005-Aug 2007	Courtesy Staff	Inland Hospital
2002-2005	Resident Physician	Maine Medical Center

AWARDS AND HONORS

Date and Organization

2016-2017	Outstanding Tufts University SOM Lecturer (Top 15%)
2015-2016	Outstanding Tufts University SOM Lecturer (Top 15%)
2009	Outstanding Peer Reviewer (Top 10%), 2009. <i>Academic Emergency Medicine</i> .
2005	Resident Teacher of the Year. Maine Medical Center.
1997	Outstanding Senior Clinical Research Award, University of Illinois

CURRICULUM DEVELOPMENT

Date, Course, Program, Department/Affiliation

2013-present	Course Director, Evidence-Based Medicine (EBM) course. Responsible for organizing and delivering the EBM curriculum for the 1 st year Tufts Maine track medical students.
2013-present	<p>Course Director, Orientation for Tufts Maine track students. Responsible for organizing the 10 day student orientation including rural site visits, introduction to the clinical setting workshops, a team building retreat on Cow Island, Maine. The following are key components of the orientation curriculum.</p> <ul style="list-style-type: none"> • Introduction to the Curriculum and McKusick Lecture • Introduction to the clinical setting workshop (Patient check-in, Patient confidentiality, Physiology of the office setting, and Professionalism) • Ethics Training • Rural preceptorship experiences • Team building exercises on Cow Island • Rural preceptor debriefing • MMC team-based care exercises
2011-present	<p>Course Director, Capstone. TUSM-MMC Program. Capstone is a one week experience that serves as an ‘intern boot camp’ and prepares Tufts Maine track students for the transition to internship. The following are key components of the Capstone curriculum.</p> <ul style="list-style-type: none"> • Introduction to Capstone and Transition to Internship • Time Management and Learning Strategies (with resident panel) • Physician Wellness • Interactive ECG Pearls

- Dilemmas in Pain Management
- Intern Documentation Pearls
- Multidisciplinary use of Preventative Medicine
- Multidisciplinary Radiology review
- Neurological Emergencies you can't miss
- Advanced directives, Death notification, AMA, and Error disclosure
- Technical skills: Basic and advanced airway techniques
- Wearing the code beeper
- Answering the page: What to expect, what not to do, when to call for help
- Cross-cover, Sign-out issues, and Difficult conversations
- Technical skills: IV, Arterial Line/ABG, IO, and Central lines
- Eye Examination pearls
- Team-based clinical challenges

2012-present Tufts-MMC Interviewing workshop, TUSM and MMC Department of Medical Education

2012-present Tufts-MMC Pathway to Residency and ERAS workshops, TUSM and MMC Department of Medical Education

2012-present Tufts-MMC Rural Elective development. Responsible for the recruitment of rural elective opportunities in Maine for 3rd and 4th year students. Multiple new and diverse opportunities now exist from Fort Kent to Mount Desert Island, Maine.

2010-present Tufts-MMC Director of the 4th year of medical school.

TEACHING RESPONSIBILITY

Date, Course, Program, Department/Affiliation

2015 Planning Committee, EM Congress (Mediterranean Emergency Medicine Congress). Rome, Italy

2013-present Course Director, Evidence-Based Medicine (EBM).

2013-present Course Director, Orientation for Tufts Maine track students.

- Faculty, Welcome and Introduction to the Curriculum
- Faculty, Introduction to the clinical setting workshop
- Faculty, Team building exercises on Cow Island

- Faculty, Rural preceptor debriefing
 - Faculty, MMC team-based care exercises
- 2013-present Course Director, Capstone. TUSM-MMC Program.
- Faculty, Introduction to Capstone and Transition to Internship overview
 - Faculty, Time Management and Learning Strategies (with resident panel)
 - Faculty, Team-based clinical challenges
- 2012-present Faculty, Introduction to the Clinical Setting. Maine track Orientation. Tufts University School of Medicine.
- 2011-present Faculty, Introduction to Clinical Reasoning Course, Tufts University School of Medicine.
- 2010-present Director, 4th Year, TUSM-MMC Program. Responsible for curriculum and elective development and oversight of the final year of medical school for Maine track students at TUSM.
- 2008-2013 Director, Tufts, Maine Medical Center, Baystate American College of Emergency Physician (ACEP) Winter Symposium.
- 2005-present Attending Physician, MMC Emergency Department. Supervising physician of emergency and off-service residents and medical students at Maine Medical Center and Brighton Firstcare campuses.
- 2005-2015 Chair, International Clinical Pathological Cases (CPC) Competition. EM Congress (Mediterranean Emergency Medicine Congress). Sponsored by the American Academy of Emergency Medicine and the European Society of Emergency Medicine. Rome, Italy. 2015. Marseille, France. 2013. Kos, Greece. 2011. Valencia, Spain. 2009. Sorrento, Italy. 2007. Nice, France. 2005.
- 2005 Emergency Medical Services Educator, Scarborough Fire Department, Scarborough, Maine
- 2004 Instructor, Wilderness/Disaster Emergency Medical Technicians Course. St. Francis Medical Center, Peoria, IL
- 2003 Emergency Medical Services Educator, Portland Fire Department, Portland, Maine

HOSPITAL, MEDICAL SCHOOL, OR UNIVERSITY COMMITTEE

ASSIGNMENTS:

2018-present Tufts 4th Year Bootcamp Strategic Planning Committee
2018-present Tufts EBM and Clinical Reasoning Strategic Planning Committee
2014-2016 Tufts Curriculum Committee
2007-2011 Clinical Decision Unit Steering Committee
2010-present Emergency Medicine Education Committee
2010-present Emergency Medicine Research Committee
2010-present Maine Track Capstone Committee
2010-2011 TUSM-MMC Curriculum Subcommittee
2011-present TUSM-MMC 'Celebration' Committee
2011-present Undergraduate Medical Education Committee
2011-present TUSM-MMC Executive Committee
2012-2013 Emergency Medicine Clinical Case Review

PROFESSIONAL SOCIETIES

American Medical Association

American College of Emergency Physicians

Society for Academic Emergency Medicine

American Academy of Emergency Medicine

Maine Medical Society

OFFICE AND COMMITTEE ASSIGNMENTS IN PROFESSIONAL SOCIETIES

Member, Society of Academic Emergency Medicine (SAEM) International Emergency Medicine Task Force

Member, American College of Emergency Physicians (ACEP) Observational Medicine Section Group

Assistant Medical Officer, Metro-Boston Disaster Medical Assistance Team (DMAT)

MAJOR RESEARCH INTERESTS

My personal interests and research focuses have primarily dealt with medical education, emergency orthopedics, and observational medicine.

EDITORIAL BOARDS AND ACTIVITY

Peer Reviewer. Emergency Medicine Reports, AHC Media LLC.

Peer Reviewer, American Journal of Emergency Medicine, Elsevier.

Peer Reviewer, Academic Emergency Medicine, Blackwell.

BIBLIOGRAPHY

Original Articles

Nelson SW, **Germann CA**, MacVane CZ, Bloch RB, Fallon TS, Strout TD.. Intern as Patient: A Patient Experience Simulation to Cultivate Empathy in Emergency Medicine Residents. *Western Journal of Emergency Medicine*. 2018. (Accepted)

[Poeppelman RS](#), [Liebert CA](#), [Vegas DB](#), [Germann CA](#), [Volerman A](#). A Narrative Review and Novel Framework for Application of Team-Based Learning in Graduate Medical Education. *J Grad Med Educ*. 2016 Oct;8(4):510-517.

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Parekh, R. and **Germann CA**: Clinicopathological Conference: A case of a 26 year-old male with diarrhea, weakness, and dizziness. *Acad Emerg Med*. 2009; 16(5): 418-22.

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Germann CA: Hand and Wrist Emergencies in Bond, Perron & Abraham: *Orthopedic Emergencies*. 2014.

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Perron AD, **Germann CA**: Trauma in Harrigan RA, Ufberg JW, Tripp ML (eds): Emergency Medicine Review: Preparing for the Boards. Elsevier, St Louis, MO. 2010.

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Wald D, House, H, **Germann CA**, et al. Senior medical student's perception of the final year of medical school: The impact of faculty advice. *Western J Emerg Med*. 2105 16(4.1): S31-S32.

Germann CA, Fix ML, Wald DA, **Strout TD**. A Qualitative Study of Transition-to-Residency Program Courses in the United States. *Annals of Emergency Medicine*. 2014; 64(4): s115-s116.

Sledge A, **Germann CA**, Strout TD. Impact of Emergency Physicians Board Certification on Patient Perceptions of ED Care Quality. *Academic Emergency Medicine* 2012; 19(s1): s110.

Germann CA, Perron AD: An Academic Emergency Department Experience with Prosthetic Hip Dislocation: A Five-Year Retrospective Study. *Ann Emerg Med* 2004; 44(4) S43.

Germann CA, Southall JC: Management of Epistaxis and Complications Associated with Anterior Nasal Packing. *Ann Emerg Med* 2004; 44(4) S43.

Burton, JH, Harrah, JD, **Germann CA**, and Dillon, DC: Does End-Tidal Carbon Dioxide Monitoring Improve Standard Practice for Predicting Clinically Important Adverse Respiratory Events During Emergency Department Procedural Sedation and Analgesia? *Acad Emerg Med*. May 2004, 11(5): 489.

Report of Teaching

Invited Teaching Presentations

2005 **Germann, CA** – Trauma Rounds: Trauma Cases from Cape Town, South Africa: Dept of Emergency Medicine, Maine Medical Center. June, 2005.

Germann, CA – Grand Rounds: Pediatric Fever: Department of Emergency Medicine, Central Maine Medical Center. December, 2005.

2006 **Germann, CA**– Critical Case Conference: Medical Clearance for Psychiatric Patients. Dept of Emergency Medicine, Maine Medical Center. September, 2006.

Germann, CA - Grand Rounds: Septic Arthritis. Dept of Emergency Medicine, Maine Medical Center. September, 2006.

Germann, CA – Critical Case Conference. Psychiatry. Dept of Emergency Medicine, Maine Medical Center. November, 2006.

- 2007** **Germann, CA** - Critical Case Conference: “Blocker” overdoses. Dept of Emergency Medicine, Maine Medical Center. February, 2007.
- Germann, CA** – Medical Student Forum. Pulmonary Embolism and Pneumonia. Dept of Emergency Medicine, Maine Medical Center. April, 2007.
- Germann, CA** – Medical Student Forum. Wound Management. Dept of Emergency Medicine, Maine Medical Center. May, 2007.
- Germann, CA** – Airway Management in a Rural Aeromedical Setting. Dept of Emergency Medicine, Maine Medical Center. May, 2007.
- Germann, CA** – Grand Rounds. Transfusion Medicine. Dept of Emergency Medicine, Maine Medical Center. July, 2007.
- Germann, CA** – Medical Student Forum. Altered Mental Status. Dept of Emergency Medicine, Maine Medical Center. October, 2007.
- Germann, CA** – Grand Rounds. Geriatric Emergencies: Abdominal Pain. Dept of Emergency Medicine, Maine Medical Center. December, 2007.
- 2008** **Germann, CA** - Grand Rounds: Preeclampsia and Eclampsia. Dept of Emergency Medicine, Maine Medical Center. April 2008.
- Germann, CA** – Grand Rounds. The Missed MI. Dept of Emergency Medicine, Maine Medical Center. July, 2008.
- Germann, CA** - Grand Rounds: Brain Trauma Foundation Guidelines Dept of Emergency Medicine, Maine Medical Center. November, 2008.
- Germann, CA** - Critical Case Conference: Abdominal pain in the elderly patient. Dept of Emergency Medicine, Maine Medical Center. December, 2008.
- 2009** **Germann, CA** - Grand Rounds: Altitude Illness. Dept of Emergency Medicine, Maine Medical Center. February, 2009.
- Germann, CA** – Grand Rounds. Observational Medicine. Dept of Emergency Medicine, Maine Medical Center. August, 2009.
- Germann, CA** - Critical Case Conference: Pediatric abdominal catastrophes. Dept of Emergency Medicine, Maine Medical Center. October, 2009.

- Germann, CA** - Critical Case Conference: EM cases from the courtroom. Dept of Emergency Medicine, Maine Medical Center. December, 2009.
- 2010** **Germann, CA** - Critical Case Conference. Orthopedic Emergencies. Dept of Emergency Medicine, Maine Medical Center. April, 2010.
- Germann, CA** - Grand Rounds: Gastrointestinal Emergencies. Dept of Emergency Medicine, Maine Medical Center. September, 2010.
- Germann, CA** - Critical Case Conference. Dept of Emergency Medicine, Maine Medical Center. September, 2010.
- Germann, CA** - Grand Rounds: Pitfalls of a rural EM practice: what you won't experience in residency. Dept of Emergency Medicine, Maine Medical Center. December, 2010.
- 2011** **Germann, CA** - Critical Case Conference: Acute Pharyngitis. Dept of Emergency Medicine, Maine Medical Center. February, 2011.
- Germann, CA** - Critical Case Conference: Risk Management. Dept of Emergency Medicine, Maine Medical Center. November, 2011.
- Germann, CA** – TEAM: Trauma Evaluation and Management: Early Care of the Injured Patient. TUSM-MMC Program. December, 2011.
- 2012** **Germann, CA** – Hand and Wrist Injuries. Dept of Emergency Medicine, Maine Medical Center, Portland, ME. February, 2012.
- Germann, CA** – Grand Rounds: Respiratory Emergencies. Dept of Emergency Medicine, Maine Medical Center, Portland, ME. May, 2012.
- 2015** **Germann, CA** – MMC Institute for Teaching Excellence Seminar. Team-Based Learning. Department of Medical Education. October 2015.
- Germann, CA** – MMC Institute for Teaching Excellence Seminar. Curriculum development and evaluation. Department of Medical Education. December 2015.
- 2016** **Germann, CA** – MMC Institute for Teaching Excellence Seminar. Team-Based Learning. Department of Medical Education. February 2016.
- Germann, CA** – MMC Institute for Teaching Excellence Seminar. Curriculum development and evaluation. Department of Medical Education. September, 2016.

Germann, CA – MMC Institute for Teaching Excellence Seminar. Assessing Competencies. Department of Medical Education. November 2016.

2017 **Germann, CA** - Critical Case Conference: Thyroid Emergencies. Dept of Emergency Medicine, Maine Medical Center. February, 2017.

Germann, CA – MMC Institute for Teaching Excellence Seminar. Team-Based Learning. Department of Medical Education. April 2017.

Germann, CA – Program Directors Conference. Curriculum development and evaluation. Department of Medical Education. September, 2017.

2018 **Germann, CA** – Grand Rounds: Abdominal Pain in the Elderly Patient. Dept of Emergency Medicine, Maine Medical Center, Portland, ME. Jan, 2018.

Regional, National, and International Invited Presentations

2005 **Germann CA, Gayer D, Perron AD:** An Academic Emergency Department Experience with Prosthetic Hip Dislocation: A 5-Year Retrospective Study. MaineHealth Research Forum, March, 2005.

Germann, CA - International CPC Competition: Moderator/Case discussant, EM Congress. Nice, France. September, 2005.

2006 **Germann, CA** – How to Prevent a Heart Attack. Guest Lecturer, Health Forum. Synergent and Credit Union League Conference. Portland, Maine. November, 2006.

2007 **Germann CA** – Clinical Pathological Case. SAEM National CPC Competition. SAEM Annual Meeting, Chicago, IL. May 2007.

Germann, CA – International CPC Competition: Moderator/Case discussant. EM Congress. Sorrento, Italy. September, 2007.

2008 **Germann CA** – Pediatric Literature Update. Tufts, MMC, Baystate Regional ACEP Emergency Medicine Winter Symposium. Kingfield, ME. February, 2008.

- 2009** **Germann CA** - Critical Care Update: The Etomidate Controversy. Tufts, MMC, Baystate Regional ACEP Emergency Medicine Winter Symposium. Kingfield, ME. March, 2009.
- Germann, CA** - International CPC Competition: Moderator/Case discussant. EM Congress. Valencia, Spain. September, 2009.
- Germann, CA** – Advanced Airway Laboratory. Presented at the American College of Emergency Physicians Scientific Assembly. Boston, MA. October 2009.
- 2010** **Germann CA** – ATLS Update. Tufts, MMC, Baystate Regional ACEP Emergency Medicine Winter Symposium. Kingfield, ME. March, 2010.
- Germann, CA** – Advanced Airway Laboratory. Presented at the American College of Emergency Physicians Scientific Assembly. Las Vegas, NV, September 2010.
- 2011** **Germann, CA** – Advanced Airway Laboratory. Presented at the American College of Emergency Physicians Scientific Assembly. San Francisco, CA, October 2011.
- Germann, CA** - International CPC Competition: Chair/Moderator. EM Congress. Kos, Greece. September, 2011.
- 2012** **Germann, CA** - Advanced Airway Laboratory. Presented at the American College of Emergency Physicians Scientific Assembly. Denver, CO, October 2012.
- 2013** **Germann, CA** – ATLS. Presented at Dhaka Medical College and Medical Center. Visiting Professor Lecture. Dhaka, Bangladesh. March 2013.
- Germann, CA** – Clinical Guidelines. Presented at Dhaka Medical College and Medical Center. Visiting Professor Lecture. Dhaka, Bangladesh. March 2013.
- Germann, CA** – Emergency Medicine: a new specialty in Bangladesh? Presented at Dhaka Medical College and Medical Center. Visiting Professor Lecture. Dhaka, Bangladesh. March 2013.
- Germann, CA** – The Golden Hour of Trauma Management. Presented at Dhaka Medical College and Medical Center. Visiting Professor Lecture. Dhaka, Bangladesh. March 2013.
- Germann, CA** - International CPC Competition: Chair/Moderator. EM Congress. Marseille, France. September, 2013.

Germann, CA - Advanced Airway Laboratory. Presented at the American College of Emergency Physicians Scientific Assembly. Seattle, WA, October 2012.

2014 **Germann, CA** - Advanced Airway Laboratory. Presented at the American College of Emergency Physicians Scientific Assembly. Chicago, IL, October 2014.

Germann CA, Fix ML, Wald DA, Strout TD. A Qualitative Study of Transition-to-Residency Program Courses in the United States. American College of Emergency Physicians Research Forum, Chicago, IL, October, 2014.

Stork R, **Germann CA**, Brandt Vegas D, Liebert CA, Volerman Beaser A. Team-Based Learning (TBL) in Graduate Medical Education: A Faculty Development Seminar. Academy of Distinguished Medical Educators 8th Annual Medical Education Day, University of Chicago, Chicago, IL, November 20, 2014.

2015 Wald D, **Germann CA**, Fix ML. Senior medical student's perception of the final year of medical school: The impact of faculty advice. Society for Academic Emergency Medicine Annual Meeting, San Diego, CA, May, 2015.

Stork R, **Germann CA**, Brandt Vegas D, Liebert CA, Volerman Beaser A. Team-Based Learning (TBL) in Graduate Medical Education: A Faculty Development Seminar. MHPE Summer Conference, University of Illinois at Chicago, Chicago, IL, July 31 2015.

Germann, CA - International CPC Competition: Chair/Moderator. EM Congress. Rome, Italy. September, 2015.

2016 **Germann CA**. Assessing noncognitive skills during the residency application process. Society of Teachers of Family Medicine (STFM) conference 2016.