Management of the Academic Emergency Department

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KEYWORDS

• Operations • Process improvement • Academic medical centers • Leadership
• Quality management

KEY POINTS

- Academic EDs play a critical role in educating future ED physicians, providing novel emergent care, and conducting research.
- Academic EDs face enormous challenges because of the decline of governmental funding for research and education and shifting payment models that emphasize efficiency and value.
- Facing such challenges, leadership within academic EDs must engage in continuous process improvement efforts to deliver more efficient care, conduct operational research, and design staffing models that promote education and account for the variability in trainee productivity.
- By improving operational efficiency and the quality of patient care, academic EDs can better contribute to national efforts that may make health care more affordable and become as clinically efficient as possible, while also supporting a complex tripartite academic mission.

INTRODUCTION

Academic emergency departments (EDs), defined as academic-affiliated EDs that engage in on-site resident education with core faculty attending supervision, play a vital role in the provision of emergency care and contributing to the training of resident physicians. Academic EDs also have a major role in generating innovations and discoveries through clinical research within US academic medical centers (AMCs).[1,2] Academic EDs need to deliver high-value care that is high in quality and efficiency. They can face increased challenges when initiating operational process improvement

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efforts because of the medical complexity of patients, the academic culture within AMCs, and the variability in productivity and specialty training of trainees. This article explores the characteristics shared by academic EDs, how to implement process improvement initiatives, the impact that trainees have on ED operations, and how to best promote operational research so as to optimize ED operations within an academic setting.

CHARACTERIZATION OF ACADEMIC EMERGENCY DEPARTMENTS: PATIENT CARE AND REIMBURSEMENTS

AMCs and academic EDs have a large economic impact within the United States, accounting for approximately $562 billion annually, or 3.1% of the gross domestic product, according to the Association of American Medical Colleges.[3,4] In addition to providing their surrounding communities with high-quality medical care, AMCs create jobs, support medical research and scientific advancements, contribute to new business development, and educate the nation's health care workforce. Academic EDs often provide critical roles as trauma centers and leadership in disaster preparedness (**Fig. 1**).[5] AMCs collectively graduate more than 19,000 physicians each year and conduct the most basic, clinical, and health services research.[6]

Academic EDs comprise only 5% of total EDs in the United States and have unique challenges and opportunities related to their tripartite mission of clinical operations, education, and research (**Fig. 2**). They tend to be concentrated in large hospitals that can support their training mission while serving as tertiary care centers and safety nets for their surrounding communities. Within the greater AMC, academic EDs play a unique role in which they provide care for the sickest patients and a large share of low-income individuals who qualify for charity care and Medicaid beneficiaries.[7,8] As a result, AMCs and academic EDs provide a disproportionate amount of care for highly acute patients and disadvantaged patients. Some of the costs of uncompensated care may be defrayed by Medicare disproportionate share hospital payments, Medicaid disproportionate share hospital payments, and payments for

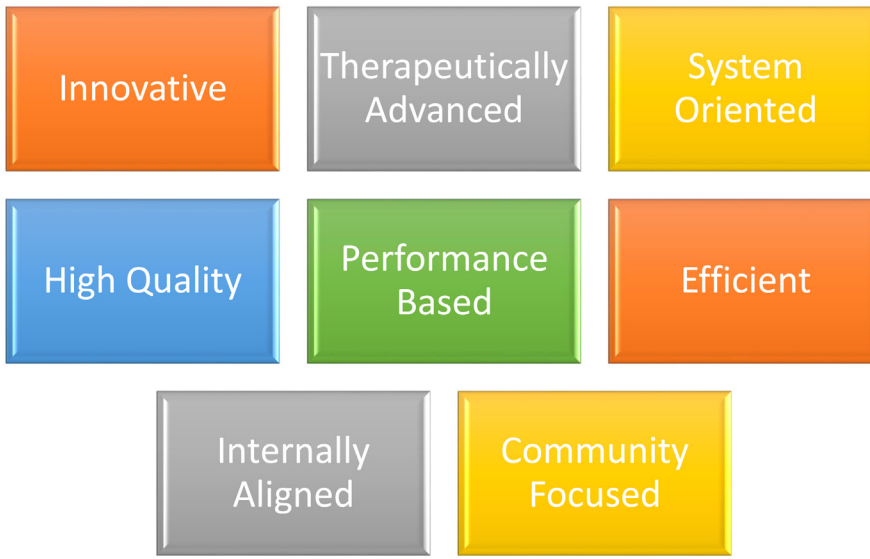

Fig. 1. Characteristics of a successful academic medical center.

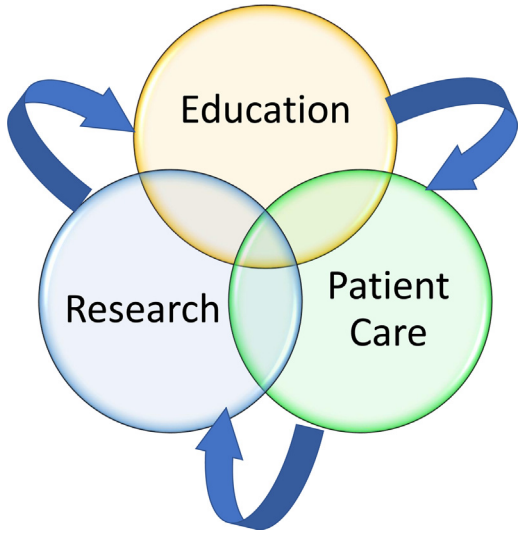

Fig. 2. AMC tripartite mission.

undocumented immigrants. However, this leaves academic EDs extremely vulnerable to changes in government payment policies and reductions in Centers for Medicare and Medicaid Services reimbursements.[9]

The distinct role that academic EDs play in providing care for complex patients and the increases in ED visits in the wake of Medicaid expansion in many states presents many academic EDs with programmatic and operational challenges.[10,11] Recent publications suggest that within academic EDs, the annual patient census increased 13.4% over a 5-year period ending in 2016, with 80% of the sites surveyed experiencing growth over the survey period.[12] Acuity and severity as measured by the Emergency Severity Index level 1 and 2 also increased in academic EDs during the study. Large-volume EDs experienced an increase in admissions of more than 15%, likely related to a surge in overall patient volumes. Emergency medical service arrivals increased by 7.3%, with admission rates from emergency medical service arrivals remaining stable. As volumes increased, left without being seen rates decreased by 19.5%, but total walk-outs, including left without being discharged or patients who left the ED against medical advice, did not. These data suggest that these centers are seeing increases in patient volume, acuity, and underlying illness severity, all of which require an increased number of resources. These trends are essential for the operational leaders within academic EDs to take into account when projecting staffing and resource needs.[13]

Simultaneously, many of these facilities face a resource crunch because of a decline of governmental funding for research and education while payment models shift to emphasize operational efficiency and value.[14] To realize their tripartite mission while ensuring financial viability, academic EDs must strive to improve efficiency, cost, and patient satisfaction while maintaining the resources to continue developing trainees and engaging in clinical research. ED operational leadership within academic centers must seek to deliver appropriate, high-quality care with excellent outcomes, efficient delivery, convenience, and low cost. This is especially critical as the focus of health care delivery shifts to incentivize the quality of care and enhancing value to the customer.[15–17] Academic EDs, just as in the community, will fall under the

scrutiny of policymakers, payers, and patients who will have the expectation that EDs publish performance data and have the ability to meaningfully respond to any critique of ED services or ongoing research.[15]

PROCESS IMPROVEMENT IN ACADEMIC EMERGENCY DEPARTMENTS

Like community EDs, academic EDs must engage in continuous process improvement. The drive to adopt health care innovations in ED practice, such as new fast-track models and telemedicine capabilities, has to be carefully tempered with the transferability of such practices or policies to the high-acuity and low-resource patient population within academic EDs.[18] Similarly, the unique faculty and practice environment within academic EDs must also be addressed, because the culture of an academic facility may hamper process improvement and create unique challenges when implementing new models of care. Academic EDs also need to explore new models of training to ensure residency programs are educating new physicians who are well-versed in clinical techniques and care models that work best as the landscape for health care continues to change.

Organizational transformation focusing on operational efficiency is extremely challenging in an academic ED setting. Academic EDs are often not designed for high-speed change because of the complicated missions, governance structures, and underlying faculty dynamics.[19] Faculty are often motivated by such factors as research, education, and intellectual curiosity rather than improving metrics, and operational concerns can run contrary to these other priorities. Within AMCs, the hierarchical structure may not necessarily favor individual administrators championing process improvement. Furthermore, the presence of multiple cultural hierarchies, including researchers, undergraduate and graduate medical educators, and clinical and educational nursing leaders, can make quality improvement efforts within academic EDs be orders of magnitude harder than in other health care settings. As a result, some AMCs are slow to adopt innovative care practices, and often are less efficient in the delivery of care compared with competing community EDs.

Given these challenges, several measures can be taken to more successfully implement process improvement projects to enhance efficiency within academic EDs. Successful tactics include engaging expert clinicians across multiple subspecialties to reach consensus and develop protocols to better standardize clinical care and reduce variability within clinical practice. Given faculty interests and diverging roles in academic departments, physician participants in process improvement efforts must also be provided with sufficient time free from competing academic responsibilities to engage in projects, and sufficient departmental resources must be allocated to the project in advance to promote faculty engagement.[20] Although divergent philosophies on patient care may still hamper efforts to improve quality and lower health care costs, inviting nonadministrative physicians to contribute to the decision-making process and serve as champions for change is key to improving the quality and value of care within the ED. Leadership within AMCs and academic EDs must demonstrate a high degree of commitment to proposed improvement initiatives with a clear set of objectives that are data-driven. For academic faculty to adopt operational changes, there must also be an emphasis on empirical data with clear quality improvement efforts that are not only specific to clinical care but to the AMC teaching mission as well.

In addition to using the aforementioned strategies to engage academic faculty in process improvement efforts, multiple methodologies exist to promote operational excellence and improve the quality of patient care within an academic ED. Many academic institutions are turning to Lean methodology, which has been effective in other

sectors to streamline processes and achieve excellent results in a cost-effective manner. Lean's core principle is that each process needs to add value as defined by the patient, and any step that fails to add value is deemed "waste." The aims of Lean methodology are to therefore eliminate waste to improve processes and ensure that all steps within the patient care process are truly "value added" steps (**Fig. 3**).[21–23] Although Lean methodology is an excellent technique to improve efficiency, in the academic ED setting, the educational mission of the institution must be considered when implementing Lean techniques. Although certain processes may not add value directly to the patient, a variety of redundant processes may enhance education and promote the training of medical students, residents, and fellows practicing within the ED.[24] Likewise, processes' impact on clinical research must be taken into account when considering any analysis or improvement. Engaging teaching faculty and researchers early in the course of process improvement efforts ensures that these complex interests are considered and can help to build support for decisions that change physician workflow or models of care.

Similar to Lean methodologies, Six Sigma is a prominent methodology within the manufacturing sector and is driving process improvement and ultimately patient care within many academic settings.[25] The emphasis of Six Sigma is on setting high objectives, collection of data, and analysis of results to reduce defects within the current operational processes.[26] Six Sigma emphasizes the need to measure defects so that a system can find ways to eliminate those defects and refine operations and move closer to "perfection."[27] Using the DMAIC method (Define, Measure, Analyze, Improve, Control) to uncover deviations and solve existing problems, Six Sigma at its core uses data and statistics to draw conclusions and optimize health care processes (**Box 1**).[28] In academic EDs, many of the processes involved in providing patient care are highly repeatable and lend themselves to the application of Six Sigma principles. Six Sigma has a tight focus on finding the voice of the customer, which is particularly complex in academic settings because the customers may be patients, trainees, or researchers, all of whom have different needs. Six Sigma's emphasis on analytical data to drive process improvement lends itself to the academic setting and as long as champions of process improvement efforts focus on highlighting how efforts will lead to improvement in the quality and safety of patient care, this strategy can yield useful results.

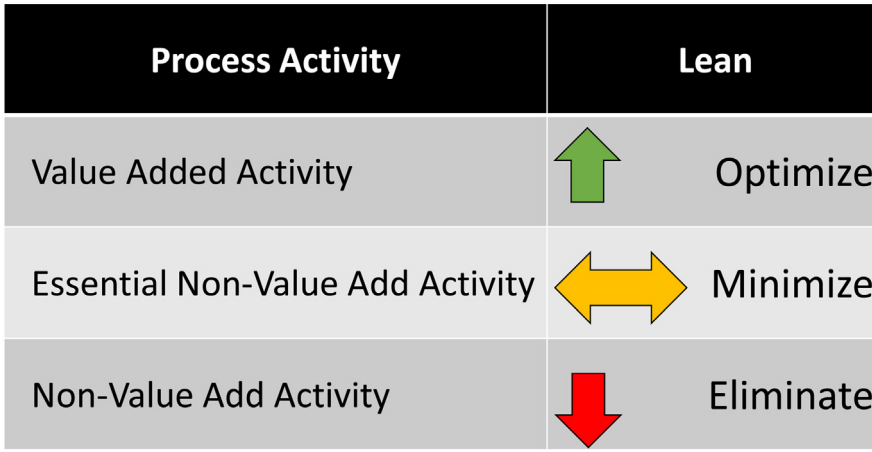

Fig. 3. Three types of Lean process activities.

Box 1
Six sigma DMAIC methodology

1. Define the problem statement then clarify scope and measurable goals
2. Measure process performance and identify performance gaps
3. Analyze the data and determine root cause of defects and waste
4. Improve the process by addressing and eliminating root causes
5. Control and maintain the improved process by implementing error proofing measures and monitoring performance

The human-centered process innovation methodology of Design Thinking also offers an innovative approach to problem solving within academic EDs and is ideal for solving abstract problems that lack concrete solutions related to patient care. Widely used in business and technology, the methodology is now being adopted in the health care setting. Design Thinking is an innovation process that prioritizes deep empathy for end-user needs to understand complex, system-wide problems and develop more effective solutions.[29,30] To do so, Design Thinking takes health care teams through five steps: (1) empathize, (2) define, (3) ideate, (4) prototype, and (5) test (**Fig. 4**). Throughout these steps, the methodology focuses on brainstorming, user needs, and collaboration, making it ideally suited for academic settings where engaging a multidisciplinary team of academicians is critical to ensure the success of the project.[31] Given this methodology's innovative and agile approach to process improvement, many AMCs are creating Design Thinking curricula to encourage its use. Although likely not an ideal method to address problems that are well understood or have a limited set of possible solutions, Design Thinking holds great promise for many patient-centered initiatives within the academic setting.

When considering introducing any of these process improvement methodologies, academic EDs should offer training to front-line staff, including nurses, physicians, and administrators, all of whom can then apply the tools and then champion subsequent improvement while remaining in their current roles.[32] Involving experts from areas affected by a process improvement project is also important for buy-in; if a project involves improving care for patients with stroke admitted from the ED, involve the neurologists who will be admitting the patient. Projects' improvements to patient safety and quality of care should be emphasized, rather than potential financial savings.

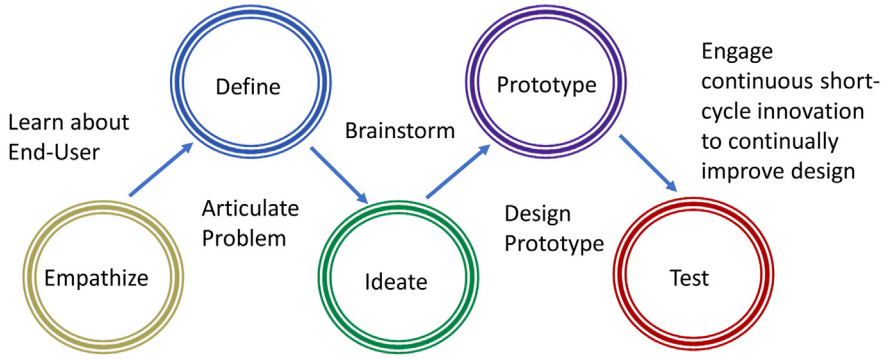

Fig. 4. Design Thinking workflow process.

IMPACT OF TRAINEES ON OPERATIONS IN ACADEMIC EMERGENCY DEPARTMENTS

Although engaging academic ED faculty in improvement efforts and operationalizing those efforts is challenging, the constant turnover of trainees, variability in trainees' skills sets and productivity, and the unique scheduling constraints within academic departments also creates hurdles to improving efficiency and quality. Within academic EDs many providers are resident physicians. Some of these may be rotators from other services and only work in the ED for a few weeks a year or over the total duration of their training. Every June, the most senior and experienced class of emergency medicine (EM) residents graduate and a new group of intern residents enter the ED workforce.[33] For many EDs, this "July effect" represents a sharp transition away from maximum efficiency.[34–36] This collective turnover of resident trainees increases operational costs and indirect costs, such as the loss of organizational knowledge, and has the potential to reduce productivity, lowers patient satisfaction, and poses a constant risk to the quality of care delivered in the ED.[37–39]

The monthly and annual turnover of residents results in known and unavoidable recurring challenges in staffing and efficiency. Although research suggests that no significant differences in ED patient length of stay clearly occur in July relative to other months, residents nevertheless have longer door-to-doctor times and times to disposition at the beginning of the academic year. With increasing experience in the ED, residents improve in performance.[40,41] Residents have been found to see increasing numbers of patients per hour as they progress through their training.[42–47] Increases in productivity by EM residents seem to correlate directly with time spent training in the ED, and not with experience on other rotations.[48] This varying productivity across postgraduate years and resident populations should be a major consideration when designing staffing models in the ED, and may lead to highly variable efficiency depending on which residents are assigned to shifts and the level of attending supervision provided throughout the day. Notably, residents at different stages of their training and in different specialties may preferentially see different kinds of patients, which must also be considered when composing schedules.

Physician shifts in an academic ED also may carry a higher degree of sign-out burden at shift change and variability in resident performance over time. Unlike many community EDs where physicians sign-out a limited number of patients at the end of clinical shifts that are staggered throughout the day, the sign-out burden in an academic setting is typically much greater often times resulting in all ED patients being handed-over from one group of residents to another at shift change.[49] This overall sign-out burden has been observed to contribute to a measurable decrease in resident productivity and requires that faculty critically evaluate the distribution of patients at the time of sign-out to promote resident educational needs, patient safety, and throughput.[50] EM resident productivity has been demonstrated to follow a reliable pattern that shows a significant decrease in patients per hour throughout a single shift, which is preserved across postgraduate years.[47,51] Given the decreased productivity after sign-out and from start to end of shift, operational leaders need to consider innovative approaches, such as staggering resident shifts, to create larger shift overlap and smooth patient flow while protecting the educational value of board rounds, but promoting efficiency and patient safety within an academic setting.[48]

Academic EDs also face unique staffing constraints and opportunities because of Accreditation Council for Graduate Medical Education (ACGME) and Residency Review Committee requirements. The Residency Review Committee requires that faculty members who supervise residents on EM rotations have appropriate qualifications

relative to the patient population for which they are providing the supervision. Attendings who are non–American Board of Emergency Medicine/non–American Osteopathic Board of Emergency Medicine certified are only permitted to work in an academic ED if such faculty do not directly supervise residents.[52] The ACGME specifies that academic EDs must maintain sufficient levels of faculty staffing coverage in the ED to ensure "adequate clinical instruction and supervision, and efficient, high quality clinical operations."[53] Acute critical care areas, which are not classified as fast-track or urgent care areas within an academic ED, must have faculty staffing ratio of 4.0 patients per faculty hour or less, which is calculated as described in **Fig. 5**. Further constraining staffing models in academic EDs, the ACGME sets work hour limits for ED residents and requires that residents have a minimum scheduled break time that is equal to the length of the preceding shift. EM residents cannot exceed 72 hours per week of clinical work in the ED. Such requirements reduce flexibility in resident schedules and place additional constraints on schedulers that are not faced in community settings.

Although ED trainees create unique scheduling constraints, trainees also afford academic EDs with opportunities to improve attending productivity and better align staffing to fit the patient-arrival curve. In academic EDs the bulk of patients are seen by residents and then staffed by an attending rather than seen independently by attendings. This pairing of an EM attending with a resident in a one-on-one teaching model allows EM attendings to see significantly more patients per hour than EM physicians alone in the same facility.[54] As a result, staffing models need to take resident and increased attending productivity into account. Although residents each see fewer patients on a shift than an attending there are also a greater number of them staffing the ED. The increased number of providers on a given shift provide academic EDs with the ability to better fit the patient arrival curve and allow for better staffing alignment hour to hour. As such, academic EDs can better adjust to surges throughout the day. Shifting physician coverage hours to match the influx of ED patients can then reduce time-to-provider and improve overall efficiency.[55]

The constant turnover and variability in productivity of physician trainees also requires that academic EDs build processes that are "foolproof" to ensure that process improvement efforts are successfully implemented despite the large number of trainees who provide patient care in the ED only for a single ED rotation. To combat the limited institutional memory that results from the constant turnover of ED trainee physician staff, standardized onboarding processes should exist to train non-EM residents who have rotations in the ED so as to familiarize them with standard operations and reduce variability in physician practice. Residents should be encouraged to use templates to ensure complete documentation and standardize practice. Academic EDs also need to leverage information technology to facilitate

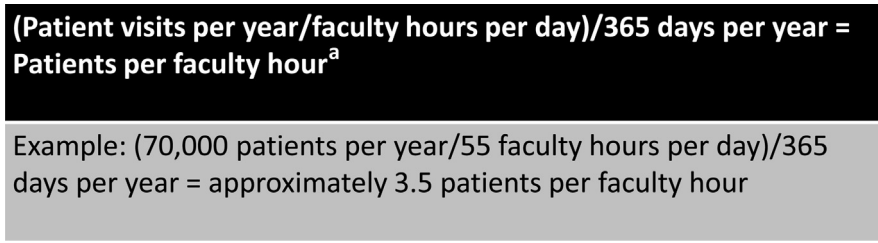

Fig. 5. ACGME-required faculty staffing ratio. [a] Faculty staffing ratios only need to be provided for acute critical care areas, and not for fast track or urgent care areas.

decision support tools, encourage appropriate orders, and reduce wasteful or redundant orders that do not change clinical care and enhance throughput. For example, a variety of academic EDs have used order sets within electronic medical record platforms to eliminate the ordering of amylase by resident physicians. It has been demonstrated that such interventions can greatly reduce the unnecessary ordering of tests that do not add value to patient care.[56] Academic EDs can integrate a variety of decision support tools within their electronic medical records to drive practice patterns and standardize care pathways in alignment with best practices, ensuring that trainees who may not be well versed in EM are guided in their clinical decisions to optimize the quality and safety of patient care and to maintain operational efficiency. Academic EDs can look to partner with other hospital units to design processes in a consistent manner to reduce variability between units and enable trainees to become rapidly familiar with the ED layout and location so as to enhance productivity during ED rotations.[57]

PROMOTING OPERATIONAL RESEARCH WITHIN ACADEMIC EMERGENCY DEPARTMENTS

Academic EDs have the opportunity to improve the quality and efficiency of patient care not only through process improvement efforts, but also by collaborating with faculty scientists to conduct operational research within the ED. Research faculty within academic EDs are often strongly motivated to advance patient care through their research efforts and have experience in measuring care quality and advanced statistical analysis skills that can be repurposed for quality improvement.[58] Promotion criteria also create strong incentives for faculty to invest time and energy in advancing the science of providing high-value care in the ED. Conducting operational research in the ED is challenging because research and operations faculty members commonly work in isolation of one another within the same department. Such divisions often result from differing sources of revenue. Although research groups typically rely heavily on extramural funding, making researchers sensitive to the priorities of granting agencies, operational activities are funded most often through clinical revenue, which rewards immediate clinical and financial outcomes.[59] Leadership within academic EDs must therefore take an innovative approach to promote operationally based scholarly activities if they are to achieve an integrated operational research mission for the department.

ED leadership can take several steps to help promote successful operational research, which include building governance and structure that provides resources and incentives to better align research and operational goals. This includes rewarding ED researchers who involve operational physician leaders in their research programs or work to embed researchers in ED operational initiatives. Researchers should be encouraged to become sensitive to operational metrics when seeking support from operational partners in projects. ED leadership can facilitate an appreciation among operational leadership regarding the potential for research to contribute to developing novel solutions to health care delivery problems. Faculty with operational roles should be encouraged to collaborate with team members from information technology, decision support, or other technologies to improve operational efficiency. Successful academic ED departments promote operational efficiency and redesign of patient care in the ED through operational research and in doing so create an environment that is for optimal academic productivity.

ED operations are a source of quality improvement, resident teaching, and research. ED operations and quality improvement projects, if conducted in a data-driven

fashion, can provide a way to introduce residents to operational and research principles. Although the barriers to entry to perform National Institutes of Health–funded research are high and the time commitment is substantial, many ED operations projects have a much shorter cycle time allowing for the involvement of residents in a meaningful way that can fit with their other work demands. Operational projects can reduce many of the difficulties of getting involved with a project because study design and data collection happens in an accelerated fashion that is dependent on patient care imperatives as opposed to relying on resident free time for project progression. In an academic setting, ED operations can serve all three of the missions of an academic center.

SUMMARY

Academic EDs play a critical role in educating future ED physicians, providing cutting-edge emergent care, and conducting research. However, academic EDs and AMCs face enormous challenges because of the decline of governmental funding for research and education and shifting payment models that emphasize efficiency and value.[60] Academic EDs are particularly vulnerable to financial and political changes within government payment programs and declining Centers for Medicare and Medicaid Services reimbursements, because they generally derive a greater proportion of payments from Medicare and Medicaid compared with community EDs. Although academic EDs may have strong reputations within their communities as being affiliated with cutting edge care, they may face lower patient volumes as nonacademic centers develop the capability to evaluate, admit, and perform procedures on patients with a higher degree of medical complexity. Facing such challenges, operational leadership within academic EDs must engage in continuous process improvement efforts to deliver more efficient life-saving care, conduct operational research, and design staffing models that promote education and account for the variability in trainee productivity. In doing so, academic EDs contribute to national efforts to make health care more affordable and become as clinically efficient as possible while supporting their complex tripartite academic mission.[61–63]

DISCLOSURE

The authors have nothing to disclose.

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