The primary purpose of this peer-reviewed journal is to provide a formal publication option for research completed by MSUCOM students, residents and faculty. SMRJ's mission is to advance medicine and medical education through the timely publication of peer-reviewed clinically-oriented research, clinically-relevant basic science research, healthcare quality research, and medical education research from MSUCOM and the osteopathic medicine community, with the ultimate goal of improving patient care and the education of patients and care providers. SMRJ is the official scholarly publication of the Statewide Campus System (SCS) of MSUCOM. It provides a forum for communicating research findings, clinical practice observations, philosophic concepts, and other biomedical and medical education advances to MSUCOM medical students, residents, fellows and faculty, and any other interested readers.

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Welcome to our Fifth SMRJ Journal Issue!

Thank you for visiting our fifth issue of The Spartan Medical Research Journal (SMRJ)!

The purpose of our online peer-reviewed journal is to provide a convenient, formal publication option for research and QI papers along with case reports and other types of papers. To date, we have received submissions from both MSUCOM students, residents, fellows and faculty and scholars outside of the MSU community. As an online journal up for 24 months, we will apply for journal indexing (i.e., assigned article “PubMed” numbers) through the US National Library of Medicine in September 2018. Any previously published SMRJ manuscripts will be retroactively assigned a Pubmed ID once our application is approved.

We at the Statewide Campus System continue to depend on the large number of colleagues serving as expert reviewers, including those who reviewed these nine Volume 3(1) submissions. We are still recruiting expert reviewers from all medical specialty areas to be members of our Editorial Board. If you have an interest in participating as a reviewer, please contact SMRJ Chief Editor Corser. If you have any journal comments or suggestions, also please contact me at any time.

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Improving Pneumococcal Vaccination Rates in a Community-Based Internal Medicine Resident Clinic

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ABSTRACT


CONTEXT: Despite proven benefits of vaccination such as reduced morbidity and mortality, many patients remain out of date on their recommended vaccines. The goal of this pilot project was to develop and test a systematic vaccination review and ordering protocol aimed to increase the percentage of patients who were assessed under current pneumococcal vaccine recommendations by 5%. METHODS: The study location was set in a community-based internal medicine resident clinic in Muskegon, Michigan, with the patient population coming from the same setting. Data from 50 patients who had completed office visit appointments at a resident clinic from January 2016 through April 7th, 2017 were randomly extracted before implementation of the protocol. Two months post-implementation, the authors obtained office visit data from another randomly selected 50 clinic patients for comparison. The nurses and medical assistants in the office had been educated on the pneumonia vaccine protocol based on CDC (United States Centers for Disease Control and Prevention) vaccination guidelines and state registry records. They were also provided copies of the seven-step vaccine assessment and ordering protocol that included obtaining MCIR (Michigan Care Improvement Registry) data to update the patient’s chart for a possible provider order set. Clinic residents were also educated on CDC pneumonia vaccine guidelines, and the authors posted several guideline-related posters on clinic walls. RESULTS: The authors initially compared the percentage of patients who providers had assessed regarding their vaccination status before protocol implementation to the percentage of patients after protocol implementation. There was a 10% post-implementation increase in pneumonia vaccination assessment. CONCLUSIONS: Although the results of this pilot project are obviously limited by methodological and sample size characteristics, the initially measured improvements in vaccination status suggests that this type of systematic protocol approach may warrant further testing in similar settings. Keywords: pneumococcal vaccination, community-based resident clinic, vaccination protocol

INTRODUCTION

Vaccines are arguably one of the greatest advances in modern medicine and responsible for the prevention, and in some cases, the almost complete eradication of
certain diseases.\textsuperscript{1} In addition, vaccinations have been proven to reduce both morbidity and mortality.\textsuperscript{2} However, despite vaccination benefits, millions of adult patients remain behind on their vaccinations as outlined by The United States Centers for Disease Control and Prevention (CDC).\textsuperscript{3}

In 1942, the CDC, a federal agency, was established to fight the spread of malaria in the southern United States.\textsuperscript{4} Since that time, the organization has expanded its focus to include general public health efforts to prevent and control a number of hazardous infectious and chronic diseases. The CDC continues to conduct research and implement disease prevention strategies that include formulation of national vaccination recommendations.\textsuperscript{4}

The large number of unvaccinated persons has a significant impact on the health and economics of individuals and populations alike. Specifically, there has been a more than 92\% reduction in incidence and a 99\% decline in deaths attributable to numerous vaccine-preventable illnesses from 1980 to the present compared to pre-vaccine eras.\textsuperscript{5}

To improve vaccination rates and break down barriers to immunization, several states have developed their own databases for tracking completed immunizations. In 1996, the Michigan Childhood Immunization Registry was developed by public health officials to track childhood immunizations. In 2006, the registry was expanded to include adult immunizations and renamed the Michigan Care Improvement Registry (MCIR).\textsuperscript{6} However, the registry continues to depend on clinic staff consistently reporting when an immunization is administered. Therefore, data in the MCIR the database is not always complete and accurate.

Since the implementation of statewide vaccination databases, there have also been several ongoing barriers identified to adult vaccinations. One study found that false assumptions, such as, “healthy people don’t need vaccinations,” influenced some patients deciding to not agree to vaccinations.\textsuperscript{7} This same research group also discovered that another important practice barrier was that many physicians were simply prioritizing other patient issues.\textsuperscript{7} Additionally, provider concerns about vaccine efficacy and adverse events following vaccine administration have also been cited in a separate study.\textsuperscript{8} A sample of internal medicine residents in another project indicated that less than half of
sample respondents know what CDC recommendations for pneumonia boosters are and whether revaccination guidelines existed.9

**History of Pneumococcal Vaccine**

The development of a Streptococcus pneumoniae vaccination started as early as 1911. These developmental efforts slowed down significantly after the discovery of penicillin. Patients continued to die from this infection despite penicillin treatments, and efforts were resumed to formulate an effective pneumococcal vaccine. In 1977, the first pneumococcal polysaccharide vaccine was licensed. This vaccine contained the polysaccharide (carbohydrate coating of the Streptococcal bacteria) antigens from 14 different sorts of pneumococcal bacteria. In 1983, the PPSV 23 (pneumococcal polysaccharide vaccine 23) which contained 23 types of pneumococcal polysaccharide antigens, replaced this vaccine.10

In 2000, the first pneumococcal conjugate vaccine was licensed covering seven different types of pneumococcal bacteria.11 This conjugate vaccine was different from the PPSV 23 in that the pneumococcal antigen is conjugated (i.e., attached) to a diphtheria toxin, another bacterium that the body has a much stronger immunologic response to. Combining these two bacterial products allows the body to develop greater immunity against the pneumococcal bacteria by associating it with the diphtheria toxin, than it would develop if only exposed to the pneumococcal bacteria.11

The efficacy of the PCV13 vaccine was determined in the CAPiTA trial (Community Acquired Pneumonia Immunization Trial in Adults).11 The study showed 46% efficacy against vaccine-type pneumococcal pneumonia, 45% efficacy against vaccine-type non-bacteremic pneumococcal pneumonia, and 75% efficacy against vaccine-type invasive pneumococcal disease.11 The efficacy of the PPSV23 vaccine was evaluated in a meta-analysis in 2013. This study determined that PPSV 23 significantly reduced the risk of invasive pneumococcal disease.11

**Purpose of Study**

The goal of this quality improvement (QI) pilot project was to develop and test a systematic vaccination review and ordering protocol aimed to increase the percentage of patients who had been assessed under current pneumococcal vaccine recommendations
by 5%. The population of resident-assigned patients in the project clinic tended to be quite unhealthy, with about 3,400 annual patient encounters and 700 missed office visits.

**METHODS**

An information technologist familiar with the Athena electronic health record (EHR) used in the authors’ resident clinic was contacted to extract data concerning all patient encounters from January 2016 until April 7th, 2017. They used Microsoft Excel software to house data from 50 random patient encounters out of several thousand patient encounters during that period. Random numbers were then assigned to each encounter. The authors then selected the “sort” option to sort the random numbers from smallest to largest values. They then selected the first 50 numbered patients for review.

To obtain an initial estimate of the overall baseline vaccination assessment rate in the resident clinic, the authors randomly selected a sample of 50 random patient encounters and reviews of their pneumonia vaccination status was determined. Then, after implementing an internally developed pneumococcal vaccination assessment and ordering protocol, this vaccination assessment rate was again measured from another random sample.

The authors examined data in the clinic EHR and MCIR registry and cross-referenced records to determine whether each sample patient had been assessed regarding their pneumococcal vaccine status observing the CDC guidelines depicted in Appendix 1. Since, both the EHR and MCIR were dependent on clinic staff reporting administered vaccinations, these databases who were not entirely accurate and may have not differentiated between the PCV13 and PPSV 23. If the patient appeared to meet the indication for receiving a pneumococcal vaccine but had received an alternate vaccine (either PCV13 or PPSV23), then the patient was still concluded to have had their vaccination status reviewed.

On April 10, 2017, authors implemented their pneumococcal vaccine review and ordering protocol. The nurses and medical assistants (MAs) in the office were educated concerning CDC pneumonia vaccine guidelines and asked to follow the seven-step internally developed clinic protocol:
1. Check to see if a MCIR report had been logged in for the patient; if not, proceed to Step 2. If a report had been logged, inform the provider and continue with your regular intake procedures.
2. Obtain the MCIR data for each patient and update their EHR to reflect previously-administered vaccines.
3. If the patient had not received or been assessed for a pneumococcal vaccine, the patient was asked if they would like to receive a vaccination that day.
4. If the patient wished to receive a vaccine, create a pneumococcal vaccine order in patient’s encounter record and administer the pneumococcal vaccine.
5. Document in patient’s EHR refusal reason if patient did not wish to be vaccinated.
6. Notify provider of patient’s vaccination status if order had been created, if vaccine was given, and whether the patient had refused.
7. Document in chart that MCIR had been reviewed, and the date during which it was reviewed.

Clinic residents were also educated concerning CDC pneumonia vaccine guidelines, and the authors posted several posters containing these guidelines for pneumonia vaccination on the clinic walls.

Two months after protocol implementation, data were extracted concerning all patient clinic encounters since January 2016. Using the same random selection sequence, fifty new discrete patients were randomly chosen from the 400-500 documented encounters during this period. Again, the authors used the Athena EHR and MCIR to determine if each post-implementation patient had been reviewed for a possible pneumococcal vaccine.

RESULTS

In the initial pre-intervention group of 50 patients, 23 (46%) patients had not had their pneumonia vaccination status assessed, and 27 (54%) had. In the second post-intervention group of 50 patients after implementation of the protocol, 18 (36%) patients had not had their pneumonia vaccination status assessed and 32 (64%) had.

Based on our comparative random sample subgroups, we may have achieved a 10% overall improvement in rates of pneumonia vaccination status assessment after
clinic protocol implementation. We should acknowledge that two months may not have really been enough time to observe a significant or sustainable pre-to-post implementation result. Unfortunately, evaluating MCIRs and EHR records for more than 50 patients pre- and 50 post-implementation patients would have required considerably more resources.

Please note that patients who did not require vaccination because they were under age 65 or had no qualifying comorbidities were treated as having had their pneumonia vaccination status reviewed. For this pilot project, those type of patients were treated in this way due to an assumption that their provider had determined that they did not require a pneumococcal vaccine at the time. However, if we had not chosen to include these patients in our calculations, the final outcome may be different and is definitely something that could be studied in the future. Certainly, our actual percentage of improvement in pneumococcal vaccination assessment could have been considerably higher or lower.

Furthermore, as this was a QI pilot project, (i.e., not a true research study), the socio-demographic characteristics of the pre and post-implementation subgroups were not inferentially examined due to the relatively small sample size. In larger future studies, researchers will need to compare pre and post-protocol implementation rates to help ensure relatively equivalency of comparison subgroups.

We did not revise the project protocol at all during our two months after implementation. The workflow between the clinical staff and the residents first appeared to go smoothly and accomplish what we hoped the protocol would achieve. Over time, however, we did note that the protocol was not followed for every patient across residents and MAs. It also seemed to become easier to disregard this protocol when the clinic was busy and understaffed during the post-implementation period. This phenomenon is important to consider since we did not systematically monitor when the protocol was being followed or not. In hindsight, we should have formulated a way to improve consistent protocol adherence for every patient encounter. This could constitute an entirely new QI project.
DISCUSSION

As discussed earlier, there are many barriers to completion of primary care pneumococcal vaccination. Patient vaccinations remain incredibly important due to their ability to lower mortality and morbidity and healthcare expenditures.\(^2\) During the implementation of our vaccination assessment protocol, we also encountered some unexpected barriers from elements of our own healthcare system. Shortly after implementation of our protocol, an email came from hospital administration to providers regarding pneumonia vaccinations. This email stated that our healthcare system would not cover pneumococcal vaccinations for patients with certain types of inadequate insurance coverage. Instead, residents were directed to print a prescription and have the patient obtain the vaccine elsewhere.

Regardless of our project limitations, it is notable that we were able to increase pneumonia vaccination assessment rates by approximately 10% in just two months. Our protocol rollout may have helped address provider lack of awareness regarding vaccination eligibility guidelines. By educating the physicians, nurses, MAs, and posting CDC guideline posters in visible clinic locations, we hoped to ensure that healthcare staff remembered to assess patients’ pneumonia vaccination status.

In 2004, a randomized trial study examined whether standing EHR physician orders or physician EHR prompts concerning pneumococcal immunizations were more effective. This study group found that automatically generated physician orders were much more effective in increasing pneumococcal vaccination rates than EHR reminders to order a pneumococcal vaccination.\(^{13}\)

Our study was somewhat similar to this 2004 trial in that we were essentially creating a protocol to remind physicians to vaccinate when indicated. As noted earlier, this protocol was not consistently followed for every patient encounter due to provider oversight and competing patient care demands. Additionally, post-project initiation of this protocol by the MAs and physicians in the resident clinic has seemed to decline significantly. Similar to this 2004 study, we have since concluded that an EHR-generated order set for the pneumococcal vaccination might have been more successful to prompt provider assessment of patients’ pneumococcal vaccination status.
Protocol Revisions

Although our project very likely lacked an adequate level of statistical power to conduct inferential statistical procedures, we did measure a small improvement in pneumococcal vaccination review rates. In the future, we are hoping to increase pneumococcal vaccination rates further in our clinic by creating a pre-completed EHR order set that will include orders for both the PCV 13 and PPSV 23 vaccinations. The MAs will be responsible for selecting this order set every time they room any incoming patient. This would require the physician to assess each patient’s pneumococcal vaccination status at every encounter. At the end of the encounter, the physician would then delete the order set if pneumococcal vaccination was not indicated or leave the recommended vaccination in the order set for the patient to receive the vaccination.

CONCLUSIONS

Based on these initial results, our pneumococcal vaccination protocol may have helped facilitate improved adherence to the national CDC guidelines. Unfortunately, it appeared to be difficult to maintain staff and physician compliance with our protocol. Future larger studies testing the implementation of more streamlined vaccination order sets to address barriers to pneumococcal vaccination may increase adherence further than vaccination review protocols.

The authors report no external funding source for this study.

The authors declare no conflict of interest.

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REFERENCES


APPENDIX 1

CDC Pneumococcal Guidelines

1. Adults age 19 through 64 with the following comorbidities should receive PPSV23:
   - CHF and cardiomyopathies (excluding HTN)
   - Chronic lung disease including COPD, emphysema, and asthma
   - Chronic liver disease including cirrhosis, alcoholism, or DM
   - Cigarette smokers
   - At age 65 or older, they should receive PCV13 and another dose of PPSV23 at least 1 year after PCV13 and at least 5 years after the most recent dose of PPSV23

2. Adults age 19 or older with immunocompromising conditions or anatomical/functional asplenia should receive PCV13 and PPSV23 at least 8 weeks after PCV13 followed by a second dose of PPSV23 at least 5 years after the first PPSV23. Immunocompromising conditions and asplenia are defined as follows:
   - Congenital or acquired immunodeficiency including B or T lymphocyte deficiency, complement deficiencies, and phagocytic disorders
     (This excludes chronic granulomatous disease)
   - HIV, chronic renal failure and nephrotic syndrome, leukemia, lymphoma,
   - Hodgkin disease, generalized malignancy, and multiple myeloma, solid organ transplant, and iatrogenic immunosuppression including long term systemic corticosteroid and radiation therapy
   - Sickle cell disease and other hemoglobinopathies, congenital or acquired asplenia, splenic dysfunction, and splenectomy

3. Adults aged 19 years or older with CSF leak or cochlear implant should receive PCV13 followed by PPSV23 at least 8 weeks after PCV13.
   - If the most recent dose of PPSV23 was administered before age 65, at age 65 or older administer another dose of PPSV23 at least 8 weeks after PCV13 and at least 5 years after the most recent dose of PPSV23

4. Adults aged 65 years or older should receive PCV13 followed by PPSV23 at least one year after PCV13
   - When both PCV13 and PPSV23 are indicated, PCV13 should be administered first
   - If PPSV23 has previously been administered, PCV13 should be administered at least 1 year after PPSV23
Chief Resident Skills: A Study on Resident Perceptions of Skill Importance and Confidence

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The review of this manuscript was coordinated by SMRJ Chief Editor William Corser

ABSTRACT
VANORDER T, WISNIEWSKI SJ. Chief Resident Skills: A Study of Resident Perceptions of Skill Importance and Confidence. Spartan Med. Res. J. Vol. 3, No. 1, pp. 12-39, 2018. CONTEXT: Chief residents (CRs) generally play a pivotal role in the graduate medical education mission to facilitate the professional development of resident physicians. Courses designed to prepare CRs for their new role previously have primarily focused on developing their teaching, evaluation and interpersonal communication skills. What remains unclear is how different types of residents (CRs versus Non-CRs and men versus women) may vary in their perception of how important particular skills are, and their confidence in performing these same skills. The purpose of this cross-sectional descriptive correlational study was to investigate the potential differences in sample respondents’ perceived importance of CR skills and respondents’ perceived confidence to perform these skills. METHODS: The authors administered a 28-item survey questionnaire to a population of 457 CR and Non-CR respondents from 20 clinical specialties regarding their perceived importance of 11 skills, as well as their self-assessed confidence in performing each skill. This study also sought to examine whether gender-based differences existed for the perceived importance and confidence of these same CR skills. RESULTS: Statistically significant differences in perceived importance and confidence levels between sample subgroups for the majority of key CR skills were observed. When asked about importance of CR skills, both CR and Non-CR respondents identified administrative and time management skills as most important, contrary to the other types of skills (e.g., teaching skills) the authors had generally expected to be most highly rated. As expected, the largest overall gap in perceived importance and self-reported confidence as either a CR or Non-CR was in the area of conflict management. Males reported higher confidence than females in each of the CR skills, with differences for five items found to be statistically significant. (p < 0.05) CR respondents also reported higher confidence in performing 10 of 11 skills at statistically significant levels. (p < 0.05) CONCLUSIONS: Although this project contributes baseline data from a relatively large sample, further studies are still required to replicate these results in other resident populations to further examine the perceptions of contemporary resident physicians concerning this vital role. Keywords: chief resident skills, skills importance, skills confidence, gender
INTRODUCTION

Today, resident physicians must develop a multitude of medical skills while providing safe patient care.1-3 Residents must acquire critical non-cognitive skills involving interpersonal communication, mitigating conflicts, team leadership, and teaching.4-6 Some residents may serve in a more involved role as chief residents (CRs) during the final year of training or for a one-year post-residency term. The CR role specifically entails leadership and administrative responsibilities in addition to traditional teaching/supervisory activities with Non-Chief residents (Non-CRs).2,5

Additionally, the dual nature of a CR as both leader and learner adds complexity during interactions with faculty, students and patients. Difficulties in communication or performance through the exercise of various roles can arise if the CR does not possess appropriate skills, knowledge, and abilities to carry out their role.7 Poor CR leadership can have a negative influence on Non-CRs, increasing conflicts within care teams, and possibly imposing adverse effects on patient care due to communication and coordination issues.8

The graduate medical education (GME) literature describes the importance of CR skills for teaching Non-CRs and medical students, leading and organizing teams, and managing administrative program affairs.9-11 However, not all CRs enter the role with the necessary skills and confidence to be effective leaders. 8,9 Over the past two decades, CR training courses have become a popular way of providing additional preparation for this critical role.8,12,13

What remains inadequately understood is whether CRs or Non-CRs would identify similar CR skills and behaviors as being critically important, or how confident they may feel in demonstrating those skills themselves. In addition, gender differences in CR leadership approaches and outcomes have apparently not been studied in the GME literature. In other fields such as business management, wherein leadership theory and practice have been studied extensively, some scholars have suggested practical differences between management approaches of male and female leaders exist to influence business outcomes.14-17 As such, the authors also wished to examine whether gender might significantly influence self-reported sample levels of CR skill importance or confidence in this similarly leadership-oriented role.
In examining the historical context of how CRs typically obtain leadership knowledge, CRs have traditionally learned important leadership skills primarily through independent means. They have typically done this by observing and emulating attending faculty members, using trial and error, or at best, by receiving cognitive apprenticeship mentoring. More recently, formal CR training courses have typically included content concerning CR behaviors and expectations specifically deemed important by clinical faculty.

Although the insights of current GME faculty are critical when designing effective CR course content, adult learning theory asserts that when adult learners can provide input into curricular design, their learning can be more effective and sustainable. Since Non-CR learners are important stakeholders in GME processes, it is critical that systematic assessments of their perceived training needs are incorporated.

**Purpose of Study**

The purpose of this cross-sectional descriptive correlational study was to investigate the correlations between respondents' perceived importance of CR skills and their personal confidence in performing each skill. Using a modified 28-item quantitative survey, the authors examined whether they could identify any gender or CR vs. Non-CR subgroup differences in survey items. The authors’ overall null hypothesis was that they would be unable to identify and perceived differences when stratifying responses by either gender or CR-Non-CR status.

**METHODS**

**Sample Participants**

After campus-based IRB approval in 2017, the authors administered the confidential study survey to a convenience sample of all residents (n = 1,986) currently enrolled in residency training programs affiliated with the Michigan State University Statewide Campus System (SCS) GME consortium. Those physicians who had already graduated from a residency program were excluded.

All SCS-affiliated residents comprised the population of interest. This study was not limited only to CRs, since the authors also wanted to understand the perceptions of Non-CRs concerning the role. Prospective respondents were from 20 clinical specialties (e.g.,
family medicine, orthopedic surgery, neurology, OB-GYN, emergency medicine) across 35 different hospital locations throughout Michigan. The demographic data that were collected included year in GME training (PGY year), gender, clinical specialty, approximate program size, and whether the respondent was a current CR or not.

**Materials & Procedures**

All data were obtained through a non-validated online Survey Monkey survey questionnaire instrument.24 (see Appendix 1 for survey instrument) Survey questions had been initially developed and content validated by a team composed of Ms. VanOrder with a GME faculty physician (Dr. Saroj Misra, FM Program Director) and the second author (SW). No existing instruments had been identified to assess CR skills, abilities, and behaviors from the Non-CR perspective. However, the format of the modified questionnaire utilized here was adapted from an instrument developed by the Sustainable Management Development Program of the Centers for Disease Control and Prevention (CDC/SMDP).25

The second part of the CDC/SMDP questionnaire asked public health employees 22 questions about core management competencies. For each competency, two components were surveyed: individual perception of the importance of the behavior (skill importance), and perceived level of knowledge/skills to perform that particular behavior (skill confidence).

Equally-weighted skill importance and confidence responses were operationalized as ordinal independent variable measures using a Likert-type scale of “1” to “5.” A rating of 1 indicated lowest perceived importance/confidence, and a rating of 5 indicates highest perceived importance/confidence. Similar to the CDC/SMDP survey,25 a five-point Likert scale was used to ask participants to rate the perceived level of perceived importance of 11 CR skills, and also as a range for level of confidence to perform each skill. The authors grouped questions as follows; four questions about CR leadership skills, four questions regarding CR teaching skills, and three questions about CR administration and time management.

Survey responses were aggregated by gender and current CR or Non-CR status. Statistical analysis examined the presence of a negative or positive correlation (Pearson r) between skill importance and skill confidence responses. The presence of the possible
moderator variable gender was included for any effect it may have had imposed any relationship between perceived skill importance and skill confidence level responses. The second author (SW) conducted all analytic procedures using SPSS version 25 analytic software.26

RESULTS

Descriptive Statistics

A total of 457 (23% of 1,986 SCS-affiliated) residents responded, with 12 (0.6%) emails bouncing back to the authors and 20 (1.01%) residents opting to simply open up the survey program without completing any items. Respondents consisted of 116 (25.3%) CRs and 341 (74.5%) Non-CRs. A total of 389 (84.9%) respondents replied to every survey question, while 69 (14.1%) only partially completed the survey. 240 (52.4%) were male, and 204 (44.5%) were female, with the remaining 13 (3.1%) choosing not to specify their gender. There were approximately 421 (91.9%) D.O.’s and 21 (4.6%) M.D.’s, and the remaining 14 (3.5%) respondents did not specify their type of medical degree. Self-reported level of PGY experience included 12 (2.6%) Fellows, 103 (22.5%) PGY1s, 110 (24.0%) PGY2s, 116 (25.3%) PGY3s, 71 (15.5%) PGY4s, and 31 (6.8%) PGY5s. Fifteen respondents (3.3%) did not specify their residency year.

Base descriptive data analyses revealed that when ranking the importance items of the Non-CR subgroup, the results demonstrated a mean score range of 2.89 (SD = 1.10) (i.e., importance of leadership Quality Improvement (QI) projects) to 4.65 (SD = 0.76) (i.e., importance of managing conflict). Those three (out of 11) items ranked as most important by Non-CRs included: a) administrative responsibilities, b) time management and efficiency, and c) managing conflict. See Table 1 for results for all survey item responses from the non-CR subgroup regarding importance.

When examining the mean score for importance for CR respondents, a similar spread from a lowest importance ranking for importance of leading QI projects, 2.97 (SD = 1.14) to that labeled as the highest importance, that of time management, at 4.41 (SD = 0.78). The three items ranked as most important by CRs included: a) teaching skills, b) managing conflict, and c) time management (See Table 2)

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Pearson r correlation analyses were performed to investigate whether there were any statistically significant associations for each question variant asking about confidence and the paired question asking about importance (e.g., “How confident are you with your ability to lead multidisciplinary health care teams?” and “How important is leadership of multidisciplinary healthcare teams as a skill all chief residents need to have?”). Bivariate correlations were statistically significant (p < 0.05) for all 11 question pairs (8a and 8b - 18a and 18b). (See Table 3)

Inferential analytics were then conducted utilizing independent t tests to examine for differences between means for each question variant (importance and confidence) by gender. Statistically significant results (p < 0.05) were observed across the questions asking about perceived confidence for the following skills:

Confidence of Skills by Gender: (see Table 4 for full results)

Leadership
- Confidence, ability to lead:
  - Male (M) 3.26 (SD = 1.15) vs. Female (F) 2.98 (SD = 1.07)

Teaching
- Confidence, giving effective feedback:
  - M 3.25 (SD = 0.99) vs. F 2.89 (SD = 0.98)
- Confidence, skills in mentoring and coaching:
  - M 3.42 (SD = 1.05) vs. F 3.20 (SD = 1.04)
- Confidence, using effective teaching strategies and practices:
  - M 3.17 (SD = 1.02) vs. F 2.88 (SD =1.00)

Time Management
- Confidence, communication strategies for managing conflict:
  - M 3.26 M (SD = 1.05) vs. F 2.97 (SD = 1.03)

Similarly, statistically significant results (p < 0.05) were found between female and male respondents across the perceived importance questions:
Importance of Skills by Gender: (see Table 5 for full results)

Leadership
- Importance, understanding leadership and communication styles:
  - M 3.69 (SD = 1.00) vs. F 4.06 (SD = 0.88)
- Importance, facilitating well-being of self and others:
  - M 3.47 (SD = 1.05) vs. F 3.92 (SD = 0.96)

Teaching
- Importance, giving effective feedback:
  - M 3.95 (SD = 0.99) vs. F 4.19 (SD = 0.84)
- Importance, using effective teaching strategies and practices:
  - M 3.65 (SD = 0.98) vs. F 3.86 (SD = 0.89)
- Importance, administrative management responsibilities:
  - M 4.06 (SD = 0.95) vs. F 4.24 (SD = 0.82)

When examining confidence responses across CR-Non-CR status, statistically significant results (p < 0.05) were observed between the two groups.

Confidence of Skills by CR-Non-CR status: (see Table 6 for full results)

Leadership
- Confidence, ability to lead:
  - Non-CR 2.95 (SD = 1.10) vs. CR 3.61 (SD = 1.03)
- Confidence, developing Quality Improvement (QI) projects:
  - Non-CR 2.40 (SD = 1.15) vs. CR 2.76 (SD = 1.08)
- Confidence, understanding leadership and communication styles:
  - Non-CR 3.24 (SD = 1.01) vs. CR 3.61 (SD = 0.97)

Teaching
- Confidence, giving effective feedback:
  - Non-CR 2.96 (SD = 0.98) vs. CR 3.39 (SD = 0.97)
Confidence, planning and conducting educational sessions:
- Non-CR 3.07 (SD = 1.18) vs. CR 3.92 (SD = 0.97)

Confidence, skills in mentoring and coaching:
- Non-CR 3.13 (SD = 1.05) vs. CR 3.81 (SD = 0.88)

Confidence, using effective teaching strategies and practices:
- Non-CR 2.88 (SD = 0.99) vs. CR 3.43 (SD = 0.97)

**Time Management**

Confidence, communication strategies for managing conflict:
- Non-CR 3.03 (SD = 1.01) vs. CR 3.35 (SD = 1.12)

Confidence, administrative management responsibilities:
- Non-CR 2.85 (SD = 1.14) vs. CR 3.44 (SD = 1.19)

Confidence, skills in time management and efficiency:
- Non-CR 3.15 (SD = 1.08) vs. CR 3.77 (SD = 1.04)

When examining perceived importance responses across CR-Non-CR status, statistically significant results (p < 0.05) were found between the two groups for only one survey item:

**Importance of Skills by CR-Non-CR status:** (see Table 7 for full results)

**Teaching**

Importance, planning and conducting educational sessions:
- Non-CR 3.77 (SD = 0.99) vs. CR 4.11 (0.91)

**DISCUSSION**

In summary, the authors found statistically significant differences in perceived importance and confidence levels between sample subgroups for the majority of key CR skills listed in the study survey. In terms of the perceived importance of specific CR skills, respondents identified administrative time management skills as most important, contrary to other types of skills (e.g., teaching skills) that the authors had generally expected to be rated as more important. However, as the authors had expected, the largest overall gap
in perceived importance and self-reported confidence as a CR vs. Non-CR was in the area of conflict mitigation.

The authors had expected to find males to be more confident than females in most CR skills, and these results did demonstrate that sample men were overall more confident than women for each of the 11 survey skills, with differences for five items found to be statistically significant. \((p < 0.05)\) This finding is similar to a previous study examining surgical resident self-assessment in which females were found to rate their overall skills and abilities (confidence) lower than men.\(^{27}\) As might be expected, we found CR respondents to be more confident than non-CR residents for 10 of the 11 survey items at statistically significant levels. \((p < 0.05)\) This finding suggests that CR pre-survey experiences and/or prior CR training may have helped them increase their skill confidence.

These findings pose several intriguing questions for future GME studies. Further studies are needed to investigate how to meet the perceived learning needs of men vs. women and residents soon to assume CR positions. Targeted educational interventions to help newer CR develop non-medical care skills (e.g., administrative skills, leading QI projects, teaching strategies for resident peers, etc.) will require further testing. It remains unclear how such types of GME workshops/training could be customized for various clinical specialty areas, or between academic versus community-based learner groups.\(^{4,8}\)

In addition, these findings appear to both match and contrast the results of earlier studies conducted to date. GME authors have predominately studied preferred CR role skills and abilities from the perspective of faculty and medical educators.\(^{4,18}\) In most GME settings, the most important CR skills are determined by clinical faculty based on: 1) accepted leadership characteristics, 2) core responsibilities to facilitate patient safety and quality care, and 3) CR role skills assumed to be most important.\(^{4,8,18}\) Few CR training courses have apparently been designed based on resident needs assessments.\(^{7,20,31}\)

The results reported in this paper certainly indicate that it may be equally important to identify critical perceived CR skills from the perspective of resident learners themselves. Varied perceptions of both CR and Non-CR residents’ confidence levels and a better understanding of the potential influence of gender may help guide GME faculty to plan and modify effective CR training courses.
Limitations

Since the authors used a cross-sectional quantitative survey questionnaire design with a convenience sample of Michigan residents, these findings may lack generalizability for many GME residency program environments. In addition, the presence of multiple potential sources of bias (e.g., self-selection, preferred responses, non-validated survey item wording) may have influenced the results.\textsuperscript{30,31} Future research designs could also entail more objective comparisons of actual CR performance vs. their perceived confidence in competently performing skills. Finally, additional comparisons across tiers of PGY levels as well as between specialties and program size could also help explain the relationships between perceived CR skill importance and confidence. Further analyses utilizing the data collected here are being planned by the authors to investigate possible differences across PGY experience, clinical specialty resident groups and program size.

CONCLUSIONS

Developing an improved understanding of the most critical CR skills and abilities has important implications for GME officials. First, further exploring self-identified CR training needs will allow for future comparisons of clinical faculty assessment ratings to inform their re-alignment of CR role expectations. Second, program directors and resident peers often select CR based on their limited demonstration of leadership and teaching qualities. Other skills or abilities (e.g., administrative management strategies, promotion of personal well-being, conflict management) might be equally or more important for targeting of CR educational offerings. Finally, identification of key CR skills and abilities might facilitate a redesign of GME educational offerings to ensure that Non-CR residents have adequate opportunities to develop such skills.

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The authors declare no conflict of interest.

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Accepted for publication April 2018
REFERENCES

### Table 1:
Mean Non-Chief Resident Importance vs. Confidence Item Ratings (N = 341)

<table>
<thead>
<tr>
<th>Question</th>
<th>Importance (SD)</th>
<th>Confidence (SD)</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead health care teams</td>
<td>3.89 (1.01)</td>
<td>2.95 (1.10)</td>
<td>0.94</td>
</tr>
<tr>
<td>Lead quality improvement</td>
<td>2.89 (1.10)</td>
<td>2.41 (1.15)</td>
<td>0.48</td>
</tr>
<tr>
<td>Lead communication</td>
<td>3.84 (0.96)</td>
<td>3.24 (1.01)</td>
<td>0.6</td>
</tr>
<tr>
<td>Lead wellbeing</td>
<td>3.69 (1.03)</td>
<td>2.95 (1.03)</td>
<td>0.74</td>
</tr>
<tr>
<td>Teach feedback</td>
<td>4.07 (0.93)</td>
<td>2.97 (0.98)</td>
<td>1.10</td>
</tr>
<tr>
<td>Teach plan</td>
<td>3.77 (0.99)</td>
<td>3.07 (1.18)</td>
<td>0.70</td>
</tr>
<tr>
<td>Teach skills</td>
<td>4.06 (0.91)</td>
<td>3.13 (1.05)</td>
<td>0.93</td>
</tr>
<tr>
<td>Teach effective</td>
<td>3.71 (0.95)</td>
<td>2.89 (0.99)</td>
<td>0.82</td>
</tr>
<tr>
<td>Conflict Management</td>
<td>4.65 (0.76)</td>
<td>3.05 (1.01)</td>
<td>1.60</td>
</tr>
<tr>
<td>Administrative responsibilities</td>
<td>4.15 (0.89)</td>
<td>2.86 (1.14)</td>
<td>1.29</td>
</tr>
<tr>
<td>Time Management and Efficiency</td>
<td>4.25 (0.78)</td>
<td>3.15 (1.08)</td>
<td>1.10</td>
</tr>
</tbody>
</table>

*bolded are the top 3 highest in each column

### Table 2:
Mean Chief Resident Importance vs. Confidence Ratings (N = 116)

<table>
<thead>
<tr>
<th>Questions</th>
<th>Importance (SD)</th>
<th>Confidence (SD)</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead health care teams</td>
<td>3.85 (1.09)</td>
<td>3.61 (1.03)</td>
<td>0.24</td>
</tr>
<tr>
<td>Lead quality improvement</td>
<td>2.97 (1.14)</td>
<td>2.76 (1.08)</td>
<td>0.21</td>
</tr>
<tr>
<td>Lead communication</td>
<td>3.92 (0.98)</td>
<td>3.61 (0.97)</td>
<td>0.31</td>
</tr>
<tr>
<td>Lead wellbeing</td>
<td>3.63 (1.14)</td>
<td>3.18 (1.09)</td>
<td>0.45</td>
</tr>
<tr>
<td>Teach feedback</td>
<td>4.04 (1.01)</td>
<td>3.39 (0.97)</td>
<td>0.65</td>
</tr>
<tr>
<td>Teach plan</td>
<td>4.11 (0.91)</td>
<td>3.92 (0.97)</td>
<td>0.19</td>
</tr>
<tr>
<td>Teach skills</td>
<td><strong>4.16 (0.84)</strong></td>
<td><strong>3.81 (0.88)</strong></td>
<td>0.35</td>
</tr>
<tr>
<td>Teach effective</td>
<td>3.85 (0.95)</td>
<td>3.43 (0.97)</td>
<td>0.42</td>
</tr>
<tr>
<td>Conflict Management</td>
<td><strong>4.31 (0.81)</strong></td>
<td>3.35 (1.12)</td>
<td><strong>0.96</strong></td>
</tr>
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<td>Administrative responsibilities</td>
<td>4.13 (0.94)</td>
<td>3.44 (1.19)</td>
<td><strong>0.69</strong></td>
</tr>
<tr>
<td>Time Management and Efficiency</td>
<td><strong>4.41 (0.78)</strong></td>
<td><strong>3.77 (1.04)</strong></td>
<td>0.64</td>
</tr>
</tbody>
</table>

*bolded are the top 3 highest in each column
### Table 3: Associations between Importance and Confidence Ratings (N = 457)

<table>
<thead>
<tr>
<th>Confidence + Importance Correlation pairs</th>
<th>Pearson’s r</th>
<th>p-value</th>
</tr>
</thead>
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<tr>
<td>lead confidence + lead importance</td>
<td>0.377</td>
<td>&lt; 0.05*</td>
</tr>
<tr>
<td>lead confidence QI + lead importance QI</td>
<td>0.506</td>
<td>&lt; 0.05*</td>
</tr>
<tr>
<td>lead confidence communication + lead importance communication</td>
<td>0.511</td>
<td>&lt; 0.05*</td>
</tr>
<tr>
<td>lead confidence wellbeing + lead importance wellbeing</td>
<td>0.41</td>
<td>&lt; 0.05*</td>
</tr>
<tr>
<td>teach confidence feedback + teach importance feedback</td>
<td>0.406</td>
<td>&lt; 0.05*</td>
</tr>
<tr>
<td>teach confidence plan + teach importance plan</td>
<td>0.478</td>
<td>&lt; 0.05*</td>
</tr>
<tr>
<td>teach confidence skills + teach importance skills</td>
<td>0.47</td>
<td>&lt; 0.05*</td>
</tr>
<tr>
<td>teach confidence effective + teach importance effective</td>
<td>0.43</td>
<td>&lt; 0.05*</td>
</tr>
<tr>
<td>time man confidence conflict + time man importance conflict</td>
<td>0.158</td>
<td>&lt; 0.05*</td>
</tr>
<tr>
<td>time man confidence admin + time man importance admin</td>
<td>0.381</td>
<td>&lt; 0.05*</td>
</tr>
<tr>
<td>time man confidence time man + time man importance time man</td>
<td>0.423</td>
<td>&lt; 0.05*</td>
</tr>
</tbody>
</table>

*statistically significant association between importance and confidence, p < 0.05

### Table 4: Mean Importance Ratings by Gender (N = 444)

<table>
<thead>
<tr>
<th>Question</th>
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<th>Female (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>lead importance</td>
<td>3.82 (1.09)</td>
<td>3.96 (0.95)</td>
</tr>
<tr>
<td>lead importance QI</td>
<td>2.91 (1.08)</td>
<td>2.91 (1.14)</td>
</tr>
<tr>
<td>lead importance com*</td>
<td><strong>3.69 (1.00)</strong></td>
<td><strong>4.06 (0.88)</strong></td>
</tr>
<tr>
<td>lead importance wellbeing*</td>
<td><strong>3.47 (1.05)</strong></td>
<td><strong>3.92 (0.96)</strong></td>
</tr>
<tr>
<td>teach importance feedback*</td>
<td><strong>3.95 (0.99)</strong></td>
<td><strong>4.19 (0.84)</strong></td>
</tr>
<tr>
<td>teach importance plan</td>
<td>3.84 (1.00)</td>
<td>3.89 (0.97)</td>
</tr>
<tr>
<td>teach importance skills</td>
<td>4.02 (0.96)</td>
<td>4.18 (0.85)</td>
</tr>
<tr>
<td>teach importance effective*</td>
<td><strong>3.65 (0.98)</strong></td>
<td><strong>3.86 (0.89)</strong></td>
</tr>
<tr>
<td>importance manage conflict</td>
<td>3.98 (0.79)</td>
<td>4.36 (0.71)</td>
</tr>
<tr>
<td>importance admin*</td>
<td><strong>4.06 (0.95)</strong></td>
<td><strong>4.24 (0.82)</strong></td>
</tr>
<tr>
<td>importance time management</td>
<td>4.26 (0.84)</td>
<td>4.33 (0.70)</td>
</tr>
</tbody>
</table>

*statistically significant difference between male and female respondents, p < 0.05
### Table 5: Mean Confidence Ratings by Gender (N = 444)

<table>
<thead>
<tr>
<th>Question</th>
<th>Male (SD)</th>
<th>Female (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>lead confidence*</td>
<td>3.26 (1.15)</td>
<td>2.98 (1.07)</td>
</tr>
<tr>
<td>lead confidence QI</td>
<td>2.55 (1.15)</td>
<td>2.44 (1.14)</td>
</tr>
<tr>
<td>lead confidence com</td>
<td>3.34 (1.03)</td>
<td>3.34 (1.00)</td>
</tr>
<tr>
<td>lead confidence wellbeing</td>
<td>2.99 (1.04)</td>
<td>3.04 (1.07)</td>
</tr>
<tr>
<td>teach confidence feedback*</td>
<td>3.24 (0.99)</td>
<td>2.89 (0.98)</td>
</tr>
<tr>
<td>teach confidence plan</td>
<td>3.33 (1.18)</td>
<td>3.27 (1.19)</td>
</tr>
<tr>
<td>teach confidence skills*</td>
<td>3.41 (1.05)</td>
<td>3.20 (1.04)</td>
</tr>
<tr>
<td>teach confidence effective*</td>
<td>3.17 (1.02)</td>
<td>2.88 (1.00)</td>
</tr>
<tr>
<td>confidence manage conflict*</td>
<td>3.26 (1.05)</td>
<td>2.97 (1.03)</td>
</tr>
<tr>
<td>confidence admin</td>
<td>3.02 (1.17)</td>
<td>3.02 (1.09)</td>
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<tr>
<td>confidence time management</td>
<td>3.29 (1.12)</td>
<td>3.36 (1.09)</td>
</tr>
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</table>

*statistically significant difference between male and female respondents, p < 0.05

### Table 6: Mean Confidence Ratings by Chief Resident Status (N = 116)

<table>
<thead>
<tr>
<th>Questions</th>
<th>Non Chief Resident (SD)</th>
<th>Chief Resident (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>lead confidence*</td>
<td>2.95 (1.10)</td>
<td>3.61 (1.03)</td>
</tr>
<tr>
<td>lead confidence QI*</td>
<td>2.40 (1.15)</td>
<td>2.76 (1.08)</td>
</tr>
<tr>
<td>lead confidence com*</td>
<td>3.24 (1.01)</td>
<td>3.61 (0.97)</td>
</tr>
<tr>
<td>lead confidence wellbeing</td>
<td>2.95 (1.03)</td>
<td>3.18 (1.09)</td>
</tr>
<tr>
<td>teach confidence feedback*</td>
<td>2.96 (0.98)</td>
<td>3.39 (0.97)</td>
</tr>
<tr>
<td>teach confidence plan*</td>
<td>3.07 (1.18)</td>
<td>3.92 (0.97)</td>
</tr>
<tr>
<td>teach confidence skills*</td>
<td>3.13 (1.05)</td>
<td>3.81 (0.88)</td>
</tr>
<tr>
<td>teach confidence effective*</td>
<td>2.88 (0.99)</td>
<td>3.43 (0.97)</td>
</tr>
<tr>
<td>confidence manage conflict*</td>
<td>3.03 (1.01)</td>
<td>3.35 (1.12)</td>
</tr>
<tr>
<td>confidence admin*</td>
<td>2.85 (1.14)</td>
<td>3.44 (1.19)</td>
</tr>
<tr>
<td>confidence time management*</td>
<td>3.15 (1.08)</td>
<td>3.77 (1.04)</td>
</tr>
</tbody>
</table>

*statistically significant difference between non chief and chief residents, p < 0.05
### Table 7: Mean Importance Ratings by Chief Resident Status (N = 341)

<table>
<thead>
<tr>
<th>Questions</th>
<th>Non Chief Resident (SD)</th>
<th>Chief Resident (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>lead importance</td>
<td>3.89 (1.01)</td>
<td>3.85 (1.09)</td>
</tr>
<tr>
<td>lead importance QI</td>
<td>2.89 (1.10)</td>
<td>2.97 (1.14)</td>
</tr>
<tr>
<td>lead importance com</td>
<td>3.84 (0.96)</td>
<td>3.92 (0.98)</td>
</tr>
<tr>
<td>lead importance wellbeing</td>
<td>3.69 (1.03)</td>
<td>3.63 (1.14)</td>
</tr>
<tr>
<td>teach importance feedback</td>
<td>4.07 (0.93)</td>
<td>4.04 (1.01)</td>
</tr>
<tr>
<td>teach importance plan*</td>
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<td>4.11 (0.91)</td>
</tr>
<tr>
<td>teach importance skills</td>
<td>4.06 (0.91)</td>
<td>4.16 (0.84)</td>
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<tr>
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<td>3.71 (0.95)</td>
<td>3.85 (0.95)</td>
</tr>
<tr>
<td>importance manage conflict</td>
<td>4.65 (0.76)</td>
<td>4.31 (0.81)</td>
</tr>
<tr>
<td>importance admin</td>
<td>4.15 (0.89)</td>
<td>4.13 (0.94)</td>
</tr>
<tr>
<td>importance time management</td>
<td>4.25 (0.78)</td>
<td>4.41 (0.78)</td>
</tr>
</tbody>
</table>

*statistically significant difference between non chief and chief residents, p < 0.05
# APPENDIX 1

## Survey Instrument

<table>
<thead>
<tr>
<th>Statewide Campus System Chief Resident Learning Needs and Preferences Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Demographics</em></td>
</tr>
</tbody>
</table>

First, please tell us about yourself:

1. Are you an intern, resident, or fellow in a Statewide Campus System/MSUCOM-affiliated training program?
   - [ ] Yes
   - [ ] No

2. Are you CURRENTLY a chief or co-chief Resident?
   - [ ] Yes
   - [ ] No
## Statewide Campus System Chief Resident Learning Needs and Preferences Survey

### Demographics continued...

#### 3. Gender
- Male
- Female
- Other

#### 4. Degree Type
- M.D.
- D.O.

#### 5. What is your current year in training (2016-2017 academic year)?
- PGY1
- PGY2
- PGY3
- PGY4
- PGY5
- Fellow
- Other (please specify)

#### 6. Residency or Fellowship Program (Please enter your specialty discipline only):

#### 7. Approximately how many residents are in your residency program (2016-17 AY)?
# Statewide Campus System Chief Resident Learning Needs and Preferences Survey

## Leadership

Please use the slider to select a range of 1-5, with 1 the least and 5 the greatest.

8a. How confident are you with your ability to lead multidisciplinary health care teams?

<table>
<thead>
<tr>
<th>1 (not at all confident)</th>
<th>3 (confident)</th>
<th>5 (extremely confident)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

8b. How important is leadership of multidisciplinary healthcare teams as a skill all chief residents need to have?

<table>
<thead>
<tr>
<th>1 (not at all important)</th>
<th>3 (important)</th>
<th>5 (extremely important)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8c. What do you believe is the primary way residents learn or acquire skills in leadership of multidisciplinary health care teams?

- [ ] Formal classroom lecture from expert(s)
- [ ] Independent reading/researching the topic
- [ ] Trial and error (learning by doing, and by reflective learning from mistakes)
- [ ] Observing and emulating faculty members and/or senior peers
- [ ] Talking with others, asking questions of peers and/or faculty members
- Other (please specify) __________

9a. How confident are you with leading quality improvement projects?

<table>
<thead>
<tr>
<th>1 (not at all confident)</th>
<th>3 (confident)</th>
<th>5 (extremely confident)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9b. How important is leading quality improvement projects as a skill or ability all chief residents need to have?

<table>
<thead>
<tr>
<th>1 (not at all important)</th>
<th>3 (important)</th>
<th>5 (extremely important)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
9c. What do you believe is the primary way residents learn or acquire skills in leading quality improvement projects?

- Formal classroom lecture from expert(s)
- Independent reading/researching the topic
- Trial and error (learning by doing, and by reflective learning from mistakes)
- Observing and emulating faculty members and/or senior peers
- Talking with others, asking questions of peers and/or faculty members

Other (please specify)

10a. How confident are you with understanding leadership and communication styles of self and others?

<table>
<thead>
<tr>
<th>1 (not at all confident)</th>
<th>3 (confident)</th>
<th>5 (extremely confident)</th>
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</table>

10b. How important is understanding leadership and communication styles of self and others as a skill all chief residents need to have?

<table>
<thead>
<tr>
<th>1 (not at all important)</th>
<th>3 (important)</th>
<th>5 (extremely important)</th>
</tr>
</thead>
</table>

10c. What do you believe is the primary way residents learn or acquire skills in understanding leadership and communication styles of self and others?

- Formal classroom lecture from expert(s)
- Independent reading/researching the topic
- Trial and error (learning by doing, and by reflective learning from mistakes)
- Observing and emulating faculty members and/or senior peers
- Talking with others, asking questions of peers and/or faculty members

Other (please specify)

11a. How confident are you with using strategies to facilitate the well-being of self and others, including fatigue and stress management/mitigation?

<table>
<thead>
<tr>
<th>1 (not at all confident)</th>
<th>3 (confident)</th>
<th>5 (extremely confident)</th>
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</thead>
</table>
11b. How important are understanding strategies for facilitating the well-being of self and others, including fatigue and stress management/mitigation, as a skill or ability all chief residents need to have?

<table>
<thead>
<tr>
<th>1 (not at all important)</th>
<th>3 (important)</th>
<th>5 (extremely important)</th>
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</thead>
</table>

11c. What do you believe is the primary way residents learn or acquire skills in strategies for facilitating the well-being of self and others, including fatigue and stress management/mitigation?

- Formal classroom lecture from expert(s)
- Independent reading/researching the topic
- Trial and error (learning by doing, and by reflective learning from mistakes)
- Observing and emulating faculty members and/or senior peers
- Talking with others, asking questions of peers and/or faculty members

Other (please specify)
### Statewide Campus System Chief Resident Learning Needs and Preferences Survey

#### Teaching

**Please use the slider to select a range of 1-5, with 1 the least and 5 the greatest.**

12a. How confident are you in giving effective feedback?

<table>
<thead>
<tr>
<th>1 (not at all confident)</th>
<th>3 (confident)</th>
<th>5 (extremely confident)</th>
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</table>

12b. How important is giving effective feedback as a skill or ability all chief residents need to have?

<table>
<thead>
<tr>
<th>1 (not at all important)</th>
<th>3 (important)</th>
<th>5 (extremely important)</th>
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</table>

12c. What do you believe is the primary way residents learn or acquire skills in giving effective feedback?

- Formal classroom lecture from expert(s)
- Independent reading/researching the topic
- Trial and error (learning by doing, and by reflective learning from mistakes)
- Observing and emulating faculty members and/or senior peers
- Talking with others, asking questions of peers and/or faculty members
- Other (please specify)

13a. How confident are you with planning and conducting educational sessions such as didactics or journal club?

<table>
<thead>
<tr>
<th>1 (not at all confident)</th>
<th>3 (confident)</th>
<th>5 (extremely confident)</th>
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<tbody>
<tr>
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</table>

13b. How important are planning and conducting educational sessions such as didactics or journal clubs as a skill or ability all chief residents need to have?

<table>
<thead>
<tr>
<th>1 (not at all important)</th>
<th>3 (important)</th>
<th>5 (extremely important)</th>
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<tbody>
<tr>
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<td></td>
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</tr>
</tbody>
</table>
13c. What do you believe is the primary way residents learn or acquire skills in planning and conducting educational sessions such as didactics or journal club?

☐ Formal classroom lecture from expert(s)
☐ Independent reading/researching the topic
☐ Trial and error (learning by doing, and by reflective learning from mistakes)
☐ Observing and emulating faculty members and/or senior peers
☐ Talking with others, asking questions of peers and/or faculty members

Other (please specify)

14a. How confident are you with your skills in mentoring & coaching junior peers and medical students?

☐ 1 (not at all confident) ☐ 3 (confident) ☐ 5 (extremely confident)

14b. How important are mentoring and coaching strategies as skills all chief residents need to have?

☐ 1 (not at all important) ☐ 3 (important) ☐ 5 (extremely important)

14c. What do you believe is the primary way residents learn or acquire skills in mentoring & coaching?

☐ Formal classroom lecture from expert(s)
☐ Independent reading/researching the topic
☐ Trial and error (learning by doing, and by reflective learning from mistakes)
☐ Observing and emulating faculty members and/or senior peers
☐ Talking with others, asking questions of peers and/or faculty members

Other (please specify)

15a. How confident are you with using effective teaching strategies and practices?

☐ 1 (not at all confident) ☐ 3 (confident) ☐ 5 (extremely confident)
15b. How important are effective teaching strategies and practices as skills or abilities chief residents need to have?

<table>
<thead>
<tr>
<th>1 (not at all important)</th>
<th>3 (important)</th>
<th>5 (extremely important)</th>
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<tr>
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</table>

15c. What do you believe is the primary way residents learn or acquire skills in teaching strategies and practices?

- [ ] Formal classroom lecture from expert(s)
- [ ] Independent reading/researching the topic
- [ ] Trial and error (learning by doing, and by reflective learning from mistakes)
- [ ] Observing and emulating faculty members and/or senior peers
- [ ] Talking with others, asking questions of peers and/or faculty members
- [ ] Other (please specify)

Other (please specify)
# Statewide Campus System Chief Resident Learning Needs and Preferences Survey

## Time management

Please use the slide to select a range of 1-5, with 1 the least and 5 the greatest.

16a. How confident are you with communication strategies for managing conflict?

<table>
<thead>
<tr>
<th>1 (not at all confident)</th>
<th>3 (confident)</th>
<th>5 (extremely confident)</th>
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</table>

16b. How important are communication strategies for managing conflict as a skill all chief residents need to have?

<table>
<thead>
<tr>
<th>1 (not at all important)</th>
<th>3 (important)</th>
<th>5 (extremely important)</th>
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</thead>
</table>

16c. What do you believe is the primary way residents learn or acquire skills in managing conflict?

- [ ] Formal classroom lecture from experts
- [ ] Independent reading/researching the topic
- [ ] Trial and error (learning by doing, and by reflective learning from mistakes)
- [ ] Observing and emulating faculty members and/or senior peers
- [ ] Talking with others, asking questions of peers and/or faculty members
- [ ] Other (please specify)

17a. How confident are you with administrative management responsibilities such as scheduling, directing work flow, and managing disciplinary issues?

<table>
<thead>
<tr>
<th>1 (not at all confident)</th>
<th>3 (confident)</th>
<th>5 (extremely confident)</th>
</tr>
</thead>
</table>

17b. How important are administrative management responsibilities such as scheduling, directing work flow, and managing disciplinary issues, as a skill all chief residents need to have?

<table>
<thead>
<tr>
<th>1 (not at all important)</th>
<th>3 (important)</th>
<th>5 (extremely important)</th>
</tr>
</thead>
</table>
17c. What do you believe is the primary way residents learn or acquire skills in administrative management responsibilities such as scheduling, directing work flow, and managing disciplinary issues?

- Formal classroom lecture from experts
- Independent reading/researching the topic
- Trial and error (learning by doing, and by reflective learning from mistakes)
- Observing and emulating faculty members and/or senior peers
- Talking with others, asking questions of peers and/or faculty members

Other (please specify)

18a. How confident are you with your skills in time management and efficiency (ability to prioritize multiple demands with limited time)?

1 (not at all confident) 3 (confident) 5 (extremely confident)

18b. How important is time management and efficiency as a skill all chief residents need to have?

1 (not at all important) 3 (important) 5 (extremely important)

18c. What do you believe is the primary way residents learn or acquire skills in time management and efficiency?

- Formal classroom lecture from experts
- Independent reading/researching the topic
- Trial and error (learning by doing, and by reflective learning from mistakes)
- Observing and emulating faculty members and/or senior peers
- Talking with others, asking questions of peers and/or faculty members

Other (please specify)
At this time we are only looking for information pertaining to current residents in a Statewide Campus System/MSUCOM-affiliated residency program.

Thank you for your time.
Statewide Campus System Chief Resident Learning Needs and Preferences Survey

Survey Complete!

Thank you for your time.
Effectiveness of a Faculty Development Course on Delivering Learner-Centered Feedback Utilizing the Flipped Training Model

Brandy Church MA,1 William D. Corser PhD,1 Angela Harrison 1

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Corresponding Author: Brandy Church MA, Brandy.Church@hc.msu.edu

ABSTRACT

CHURCH B, CORSER WD, HARRISON A. The Effectiveness of a Faculty Development Course on Delivering Learner-Centered Feedback Utilizing the Flipped Training Model. Spartan Med. Res. J. Vol. 3, No. 1, pp. 40-51, 2018. CONTEXT: Effective feedback is an important step in the acquisition of residents’ clinical skills and a key component of most adult learning strategies. Faculty-resident feedback discussions can facilitate resident self-assessment and reflection on their performance and motivate them to study and ask questions in areas where their knowledge may be evaluated as deficient. The flipped training model approach, a type of blended learning that reverses the traditional learning environment by delivering instructional content outside of the classroom, has garnered increased support within both graduate medical education (GME) and other healthcare disciplines. METHODS: The overall purpose of this exploratory pilot project was to examine the pre-post impact of a faculty feedback flipped training model course provided to a convenience sample of community-based faculty learners. After receiving campus IRB approval, the authors developed a set of five primary course goals and objectives. A convenience sample of n = 17 community-based faculty who had completed the entire course were administered a pair of pre and post-course surveys regarding their overall feedback satisfaction and comfort levels for supervising residents. RESULTS: In summary, five of the 13 total survey items increased at statistically significant levels from pre-course levels. The majority of qualitative faculty comments also positively evaluated the flipped training model approach. CONCLUSIONS: These promising pilot findings suggest that a flipped GME faculty feedback skills training model can help improve faculty learners’ satisfaction and confidence as they supervise residents and/or medical students. The impact of these types of flipped training models for GME faculty needs to be more rigorously examined in project settings with larger samples to identify what specific types of curricular activities might prove to be most effective for diverse faculty learners in GME programs across the nation. Keywords: flipped training model, faculty resident supervision, resident feedback
INTRODUCTION

Resident physicians frequently learn through direct clinical encounters with patients under faculty supervision.\(^1\) As such, faculty feedback concerning resident performance is a critical element of their professional development.\(^1\) Effective faculty feedback helps residents improve professional behaviors and performance to meet residency program objectives.\(^1\) In fact, current Accreditation Council for Graduate Medical Education (ACGME) accreditation standards emphasize the necessity of direct trainee observation and provision of timely faculty feedback.\(^1\)

Effective feedback is an important step for residents to acquire clinical skills and a key component of most adult learning strategies.\(^2\) Faculty-resident feedback discussions can facilitate resident self-assessment and motivate them to study in areas where their knowledge has been evaluated as deficient.\(^2\) Without effective feedback, residents’ medical care mistakes may go uncorrected without reinforcing their good clinical performance.\(^3,4\)

Studies have indicated that the impact of faculty feedback messages is often related to the manner in which the feedback was provided.\(^5-7\) Feedback confined to an explanation of what practices should be changed can have minimal impact on subsequent behaviors.\(^8-10\) Specific suggestions concerning how to improve/modify practice activities or recommendations regarding the acquisition of a new skill, however, can lead to longer-term improvements in both learner knowledge and skill levels.\(^10,11\) On the other hand, ineffective feedback can cause learners to feel personally assaulted, or that their thoughts, opinions, and ideas are being ignored/slighted, frequently leading to defensiveness.\(^12,13\)

The truth is that medical trainees in graduate medical education (GME) environments more often desire honest faculty feedback. For example, a study of over 1,500 residents found that 96% of respondents believed that instructor feedback was an important part of their learning, although most residents described their having received feedback as uncommon.\(^8\) During another study, residents indicated that feedback typically just reinforced positive behaviors or skill performance, rather than providing them constructive information for areas needing improvement.\(^9\) In this study, 80% of resident respondents indicated that they had either infrequently or never received corrective
feedback. This finding indicates that there may be a compelling need to improve how residents are provided feedback in many GME settings.\textsuperscript{9}

The flipped training model approach, a type of blended learning that reverses traditional didactic learning techniques with delivering online content before classroom activities, has garnered increased support in GME and other healthcare disciplines.\textsuperscript{14-17} Using this type of training approach, learners generally complete online content traditionally delivered in classroom lecture sessions to practice applying these concepts during classroom activities rather than completing it as assigned “homework.”

**Project Purpose**

The overall purpose of this exploratory pilot project was to examine the pre-post course impact of a faculty feedback flipped training model course provided to a convenience sample of community-based faculty learners.

**METHODS**

After receiving campus IRB approval, the authors, all employed by the Michigan State University Statewide Campus System (SCS) \textsuperscript{18} developed a set of five primary course goals and objectives for faculty participants to learn principles of providing effective learner-centered feedback to residents. These objectives included: a) describing why feedback is important for resident development; b) identifying key elements of effective feedback messages; c) describing proven strategies to provide feedback in GME settings; d) applying these principles during various teaching scenarios; and e) adapting popular feedback approaches to help create dynamic faculty-resident feedback discussions. A Feedback Course Committee consisting of three practicing clinicians and two PhD educators had consulted with the authors to make developmental curricular improvements. (Acknowledgements Section)

To meet the course objectives, the authors formulated faculty learner self-assessments and summative course evaluations aligned to each of the different objectives. Using Bloom’s taxonomy,\textsuperscript{19} the authors identified which objectives could be adequately covered by the online course content assignments. The authors then worked with the educator consultants to designate the objectives associated with higher-level
(e.g., application, synthesis, evaluation) observable behaviors for the hands-on classroom workshop.

The online course objectives and assessments were used to create an online course using the *Desire2Learn* learning management software.\(^\text{20}\) This part of the course contained a series of 10-12-minute snippets of content regarding how to provide learner-centered feedback, relevant literature concerning the topic, as well as video segments for feedback visualization.

After the online course components were finalized, the authors met with the University of Michigan’s Center for Research on Learning and Teaching (CRLT) Players \(^\text{21}\) to plan the interactive workshop activities. This group of trained professional actors facilitated faculty development events to create instructor-learner cases during in-classroom faculty activities. During the workshop, the CRLT Players acted out resident feedback case scenarios and the authors asked faculty participants to provide feedback to the actors concerning their feedback behaviors and messages.

After the formulation of the online course and face-to-face workshop were complete, approximately 2,000 SCS-affiliated core faculty, program directors, and directors of medical education were emailed course promotion materials. Nineteen (0.95\%) faculty completed the course registration process.

To evaluate the potential of the flipped training model approach to influence pre and post-course faculty learners’ feedback satisfaction and confidence levels, the authors administered a hard copy of the earlier-validated Faculty Feedback Survey (FFS) \(^\text{7}\) before and after the course was completed. \((\text{Appendix 1})\) Along with a series of items asking respondents about their GME characteristics, the FFS was comprised of a series of 13 key Likert scale items asking respondents about their current level of satisfaction with their feedback skills and overall level of confidence providing residents with feedback.

The authors sent instructions regarding how to access the online course content. Two registrants failed to complete the online course and were not invited to the subsequent in-class workshop. Each of the remaining 17 registered participants attended the event and completed the post-course survey to measure any changes in their feedback knowledge attainment.
RESULTS

Descriptive Statistics

A total sample of 17 faculty respondents completed over 95% of FFS 7 survey items in both pre and post-course surveys. Nine (47%) sample respondents reported their gender as Male, nine (47%) participants were Female, and one (5%) faculty reported their gender as Transgender at time of the post-course survey. Six faculty indicated that they had been supervising residents and/or medical students for between Zero and Five Years, with six reporting Six to Ten Years and the remaining respondents reporting 11 years or More. Only two (11%) faculty indicated that they had received any prior formal feedback training.

Two (11%) faculty indicated before the course that they “rarely” ever provided such feedback to residents/students, four (21%) indicated Not Every Day to this survey item, with the remaining 11 (58%) of faculty indicating Not Every Day but Every 2 to 5 Days. A total of 15 (88%) of sample faculty indicated that they had generally “enjoyed providing feedback” to residents/medical students.

Each of the 17 survey respondents indicated at least two “barriers” to their providing either positive feedback and/or constructive criticism to residents/students (from a total of 12 provided barriers). The Mean number of barriers reported by participants was 3.94 (SD 1.89) and ranged from two to seven. Cited barriers included: a) Don’t Feel Skilled at Giving Feedback. (n = 6), b) Residents/medical students don’t accept feedback well. (n = 5), c) I don’t want to harm my rapport with residents/students. (n = 16), d) Time constraints. (n = 11), e) I don’t think of it during shift. (n = 5) and f) Lack of a Private Place to Talk. (n = 4).

Pre and Post-Course Survey Response Patterns

The analyst author (WDC) generated descriptive analyses of the working data set to evaluate appropriate analytic options and compare pre-to-post-course feedback response data. As might be readily expected from a smaller self-selected sample, he confirmed that the distribution of summary and individual FFS 7 score patterns was not normally distributed. In response, a series of non-parametric Wilcoxon Matched Pair t test analytic procedures 22 were completed using SPSS Version 22 23 analytic software. The authors used these procedures to compare potential pre-post differences in individual-
item and composite pre-post course respondent feedback satisfaction and confidence scores for statistical significance observing a two-tailed coefficient Alpha level of 0.05.

Pre-Course Surveys

A total convenience sample of 17 faculty completed the FFS both before, and after they completed the flipped curriculum feedback course to be included in analyses. With regard to the three (i.e. quality of feedback (QF), amount of feedback (AF), timeliness of feedback (TF) “summary” feedback satisfaction items, the sample pre-course means were obtained: a) QF Mean 3.47 (SD 0.624), b) AF Mean 3.18 (SD 0.728), and c) TF Mean 3.47 (SD 0.717). (on possible five-point Likert scale from “1” (“Very Dissatisfied”) to “5” (“Very Satisfied”). These initial findings demonstrated that the average course participant felt a moderate level of pre-workshop satisfaction with the feedback patterns they currently provided residents and students. (See Table 1 for all summary and individual pre and post-course respondent scores).

The next eight individual pre-course feedback satisfaction item ratings data were fairly similar to the summary pre-course measures, (although each item on a five point “0” (“Poor”) to “5” (“Excellent”) scale). Participants’ self-rating scores each averaged in the “3” (Good) or “4” (“Very Good”) rating categories. Two remaining comfort survey items (on an eight-point Likert scale from “1” (“Extremely Uncomfortable”) to “8” (“Extremely Comfortable”) averaged slightly higher than the satisfaction items in the 5 or 6 categories. (Table 1).

Comparison of Pre-to-Post-Course Feedback Satisfaction and Comfort Levels

Each of the three (i.e. QF, AF, TF) pre-to-post-course feedback satisfaction ratings scores were found to have increased at statistically significant levels (t scores between = 2.135 and 2.729, p values ranging from 0.015 to 0.049). (Table 1). Overall, however, the majority of individual feedback satisfaction (n = 8) or comfort (n = 2) score increases failed to reach statistical significance except for one item (i.e., Quality of Feedback to Residents related to Procedural Skills) (t = 2.631, p = 0.025). (Table 2)

Readers should note that only two of these eight individual survey items had complete participant data, indicating that respondents may have experienced some difficulty answering some of these items. In addition, one of the two final feedback comfort
survey items with complete survey data (i.e. Overall Comfort with Providing Constructive Criticism) also increased significantly ($t = 2.190, p = 0.044$) after the workshop. (Table 2)

In summary, five of the 13 total post-course survey items were shown to have increased at statistically significant levels from pre-course levels.

**Post-Course Evaluations**

Eleven additional items in the post-course survey were included to ask respondents to evaluate different aspects of the on-line feedback and in-class workshop components of the curriculum. In summary, at least 64% of respondents reported either Agree or Strongly Agree when positively evaluating parts of the feedback course on a possible five point Likert-type scale from “1” “Strongly Disagree” to “5” “Strongly Agree” scale. Approximately five (26%) participating faculty reported some degree of difficulty either accessing the online course and/or navigating online course content.

**DISCUSSION**

In summary, five of the 13 total post-course FFS survey items increased at statistically significant levels from pre-course levels. Similar to several earlier GME studies, the majority of participating faculty comments also positively evaluated the flipped curriculum online content and workshop activities.

Readers should consider these initial pilot results within the context of several clear project limitations. The results came from a smaller convenience sample of 17 GME faculty who already appeared from pre-course survey responses to be fairly satisfied and/or comfortable with their resident feedback behaviors. The project was certainly likely underpowered to detect some meaningful pre-post-course sample subgroup differences (e.g. male versus female residents) that might be detectable in a larger diverse faculty sample. The authors acknowledge that measured increases in participants’ feedback satisfaction and confidence ratings may have been somewhat skewed by some degree of Hawthorne/observer effect since respondents knew their study responses would be reviewed by the authors.
CONCLUSION

These promising project findings suggest that a flipped GME faculty-training model may be useful to improve faculty feedback satisfaction and comfort when supervising residents and/or medical students. The full impact of these types of curricular models for GME faculty requires studies more rigorously examined in settings with larger samples to tease out what specific types of curricular activities might be most effective for the diverse faculty learners.

In hindsight, the authors could have more aggressively tried to address and discuss perceived barriers to providing resident feedback for faculty during the online pre-course training content. The authors could have also increased in-class feedback training activities to provide faculty with more opportunities to apply this content in a variety of hypothetical scenarios.

These measured improvements in faculty learners’ perceived feedback satisfaction and comfort provide evidence suggesting that the more purposeful targeting and delivery of such educational curricula may contribute to community-based GME faculty development programs. Ideally, the curricular refinements developed from future studies will lead to improvements in the feedback patterns of GME faculty supervising residents and medical students across the nation.

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4. Dr. Jonathan Rohrer, PhD, DMin, Associate Dean, Statewide Campus System, MSU College of Osteopathic Medicine, East Lansing, MI.
5. Dr. Margaret Kingry, PhD, Associate Professor, Department of Pediatrics, College of Osteopathic Medicine, Michigan State University, East Lansing, MI.

REFERENCES

TABLES AND FIGURES

Table 1: Descriptive Statistics of Faculty Feedback Survey Scores (N = 17 GME Faculty)

<table>
<thead>
<tr>
<th>I. Summary Feedback Scores</th>
<th>Pre-Course Mean (SD) (range)</th>
<th>Post-Course Mean (SD) (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of (My) Feedback to Residents/Medical Students</td>
<td>3.47 (SD 0.624) (2 to 4)</td>
<td>4.00 (0.612) (3 to 5)</td>
</tr>
<tr>
<td>Amount of (My) Feedback to Residents/Medical Students</td>
<td>3.18 (SD 0.728) (2 to 4)</td>
<td>3.76 (0.903) (2 to 5)</td>
</tr>
<tr>
<td>Timeliness of (My) Feedback to Residents/Medical Students</td>
<td>3.47 (SD 0.717) (2 to 5)</td>
<td>3.88 (0.928) (2 to 5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>II. Individual Feedback Satisfaction Scores</th>
<th>Pre-Course Mean (SD)</th>
<th>Post-Course Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. “Quality of (My) Positive Feedback”</td>
<td>4.00 (0.730)</td>
<td>4.25 (0.577)</td>
</tr>
<tr>
<td>2. “Quality of (My) Constructive Criticism”</td>
<td>3.31 (0.704)</td>
<td>3.69 (0.793)</td>
</tr>
<tr>
<td>3. “Quality of Feedback regarding Medical Knowledge”</td>
<td>3.14 (0.770)</td>
<td>3.57 (0.646)</td>
</tr>
<tr>
<td>4. “Quality of Feedback re: Communication Skills”</td>
<td>3.27 (0.961)</td>
<td>3.87 (0.915)</td>
</tr>
<tr>
<td>5. “Quality of Feedback re: Professionalism”</td>
<td>3.27 (0.961)</td>
<td>3.73 (0.961)</td>
</tr>
<tr>
<td>6. “Quality of Feedback re: Procedural Skills”</td>
<td>3.27 (1.104)</td>
<td>3.82 (1.178)</td>
</tr>
<tr>
<td>7. “Quality of Feedback re: Documentation”</td>
<td>3.46 (0.967)</td>
<td>3.85 (0.801)</td>
</tr>
<tr>
<td>8. “Quality of Feedback re: Evidence-Based Decision making”</td>
<td>3.47 (0.834)</td>
<td>3.73 (0.961)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>III. Summary Comfort Scores</th>
<th>Pre-Course Mean (SD) (range)</th>
<th>Post-Course Mean (SD) (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. “Comfort Providing Positive Feedback”</td>
<td>6.29 (1.359) (4 to 8)</td>
<td>6.59 (0.030) (5 to 8)</td>
</tr>
<tr>
<td>2. “Comfort Providing Constructive Criticism”</td>
<td>5.18 (1.629) (2 to 8)</td>
<td>6.00 (1.414) (3 to 8)</td>
</tr>
</tbody>
</table>
### Table 2: Pre and Post-Course Faculty Feedback Survey Scores
(N = 17 GME Faculty with complete data) *

<table>
<thead>
<tr>
<th></th>
<th>Pre-Course Mean Score</th>
<th>Post-Course Mean Score</th>
<th>Difference</th>
<th>Z Score</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. Summary Feedback</strong></td>
<td></td>
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<tr>
<td>Scores (poss. range 1</td>
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<td>through 5)</td>
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</tr>
<tr>
<td>1. Quality of My Feedback</td>
<td>3.47</td>
<td>4.00</td>
<td>+ 0.529</td>
<td>2.729</td>
<td><strong>0.015</strong></td>
</tr>
<tr>
<td>2. Amount of My Feedback</td>
<td>3.18</td>
<td>3.76</td>
<td>+ 0.588</td>
<td>2.582</td>
<td><strong>0.020</strong></td>
</tr>
<tr>
<td>3. Timeliness of My Feedback</td>
<td>3.47</td>
<td>3.88</td>
<td>+ 0.412</td>
<td>2.135</td>
<td><strong>0.049</strong></td>
</tr>
<tr>
<td><strong>II. Individual Feedback</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfaction Scores (poss.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>range 0 through 5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Quality of (My) Positive Feedback*</td>
<td>4.00</td>
<td>4.25</td>
<td>+ 0.025</td>
<td>1.464</td>
<td>0.164</td>
</tr>
<tr>
<td>2. Quality of (My) Constructive Criticism*</td>
<td>3.31</td>
<td>3.69</td>
<td>+ 0.375</td>
<td>2.087</td>
<td>0.054</td>
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<tr>
<td>3. Feedback regarding Medical Knowledge*</td>
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<td>3.57</td>
<td>+ 0.429</td>
<td>1.710</td>
<td>0.111</td>
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<tr>
<td>4. Feedback re: Communication Skills*</td>
<td>3.27</td>
<td>3.87</td>
<td>+ 0.600</td>
<td>1.964</td>
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<tr>
<td>5. Feedback re: Professionalism*</td>
<td>3.27</td>
<td>3.73</td>
<td>+ 0.467</td>
<td>1.974</td>
<td>0.068</td>
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<td>6. Feedback re: Procedural Skills*</td>
<td>3.27</td>
<td>3.82</td>
<td>+ 0.545</td>
<td>2.631</td>
<td><strong>0.025</strong></td>
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<tr>
<td>7. Feedback re: Documentation*</td>
<td>3.46</td>
<td>3.85</td>
<td>+ 0.385</td>
<td>1.806</td>
<td>0.096</td>
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<tr>
<td>8. Feedback re: Evidence-Based Decision making*</td>
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<td>3.73</td>
<td>+ 0.267</td>
<td>1.468</td>
<td>0.164</td>
</tr>
<tr>
<td><strong>III. Summary Comfort</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scores (poss. range 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>through 8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Comfort Providing Positive Feedback</td>
<td>6.29</td>
<td>6.59</td>
<td>+ 0.294</td>
<td>1.429</td>
<td>0.172</td>
</tr>
<tr>
<td>2. Comfort Providing Constructive Criticism</td>
<td>5.18</td>
<td>6.00</td>
<td>+ 0.824</td>
<td>2.190</td>
<td><strong>0.044</strong></td>
</tr>
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</table>

*Series of Wilcoxon Matched Pair Tests
Statistically Significant Differences at Alpha of less than 0.05 are listed in **Bold** font
Original Contribution

Cardiovascular Factors Associated with Septic Shock Mortality Risks

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ABSTRACT


CONTEXT: The presence of at least one underlying chronic health condition, such as long-term care facility residence, malnutrition, immunosuppression, or prosthetic device use, are well known factors increasing infection risks and progression to severe sepsis. Furthermore, some degree of cardiovascular dysfunction occurs in the majority of septic patients and this prognostic significance has become increasingly recognized. Since septic shock carries the highest mortality risk on the sepsis spectrum, it is important to evaluate the cardiovascular risk impact on mortality in this subset of patients. METHODS: The retrospective parent study contributing these electronic health record data was IRB approved and conducted across four hospital intensive care units within the authors’ Michigan healthcare system. Patients with cardiopulmonary arrest or transfers from an outside facility were excluded. The authors evaluated the presence of modifiable and non-modifiable cardiovascular risk factors in septic shock patients upon admission to an emergency department. RESULTS: The authors’ final analytic sample included n = 109 adults who were discharged alive compared to those who died during hospitalization. Those patients who died were more often male with an underlying history of hypertension, congestive heart failure, coronary artery disease, or peripheral arterial diseases, were taking pre-admission beta-blocker medications, and had higher APACHE II scores at admission compared to the patients who survived to discharge. Significantly higher mortality risks were found in sample patients with increased troponin levels on admission and atrial fibrillation. CONCLUSIONS: Appropriate triage and prompt treatment of these patient groups with tailored therapy to stabilize and improve cardiac dysfunction in the emergency department could potentially lead to improved survival outcomes. Clinicians need more studies to determine therapeutic targets most impacting underlying pathophysiologic mechanisms such as elevated troponin and atrial fibrillation that greatly increase mortality risks. Keywords: septic shock mortality, cardiovascular disease, mortality risks
INTRODUCTION

Sepsis can be a potentially life-threatening complication of infection. Sepsis occurs when chemicals released into the bloodstream normally to fight infection trigger inflammatory responses throughout the body. This inflammation inadvertently triggers a cascade of changes that can damage multiple organ systems, causing them to fail. The incidence of severe sepsis increases disproportionately in older adults, with more than half of severe sepsis cases occurring in adults over 65 years of age. The majority of severe sepsis patients also have at least one chronic health condition such as chronic obstructive pulmonary disease, malignancy, chronic renal or liver disease, and diabetes. Other risk factors for progressing to severe sepsis include living in a long-term care facility, malnutrition, immunosuppressive therapy, and using a prosthetic device.

A compromised immune system will significantly increase a patient’s risk for infection and severe sepsis. Some degree of cardiovascular dysfunction is common in patients who become critically ill with sepsis, and the incidence increases with the severity of their cardiac impairment. Severe sepsis occurs in nearly 70% of all septic patients and can manifest as hemodynamic instability, cardiac biomarker elevation, myocardial dysfunction on echocardiography, and end-organ hypo-perfusion.

Cardiovascular dysfunction in sepsis is associated with relatively worse hospital and long-term outcomes, necessitating early diagnosis and management. The severity of a patient’s infection and initiation of proper management protocols often guides providers’ use of clinical data applied to the sepsis criteria. Some non-modifiable risk factors in conjunction with modifiable risk factors can place certain septic shock patients at a higher risk for death, and it is thus imperative to modify sepsis therapy accordingly.

The primary goals of these retrospective analyses were to evaluate the presence of modifiable and non-modifiable cardiovascular risk factors in septic shock patients upon admission to an emergency department (ED) and investigate the impact of specific cardiovascular risk factors on mortality in septic shock patients.
METHODS

Study design
Before data collection, the Institutional Review Board at the Henry Ford Hospital, Detroit, Michigan, had approved the parent study from which these data were derived. The authors’ study population included a historical cohort of all consecutive adults admitted for septic shock over a 32-month period. The study had been conducted across four Henry Ford Health System university-affiliated hospital intensive care units.

Sample Patients
The analytic sample was comprised of the population of non-pregnant adult patients aged 18 to 90 years old diagnosed with septic shock within the first 48 hours of their hospital admission. For these analyses, septic shock was defined as patients requiring vasopressors to maintain a mean arterial pressure of 65 mm. Hg. or greater despite adequate fluid resuscitation, as well as a serum lactate level greater than 2.0 mmol/L in the absence of hypovolemia. Patients who had sustained a cardiopulmonary arrest or transferred from another facility were excluded. Overall, 719 septic shock patients were initially screened, and an analytic convenience sample of n = 109 (15.2%) eligible patients met inclusion criteria.

Data Collection and Definitions
The electronic medical records of eligible patients diagnosed with septic shock were reviewed, and data pertaining to their socio-demographics and pertinent comorbid conditions (i.e., cardiovascular conditions) were sought. Over two-to-three months, the team of authors manually extracted data concerning the impact of cardiovascular risk factors on mortality outcomes. Of note, prior and during hospitalization transthoracic echocardiographic (TTE) data were evaluated. However, this sample subgroup was small and reporting was not consistent (i.e., some patients only had received a limited TTE). Therefore, only ejection fraction data prior and during patients’ hospitalization was reported. Patients’ past history of hypertension (HTN) and previous antihypertensive medication use was reviewed, specifically beta-blockers and calcium channel blockers.

Patients’ biologic profile, including hemoglobin, albumin, cardiac biomarkers, and their overall impact on mortality was also evaluated. Troponin labs were performed using the Siemens Centaur Method (TnI) with results >99th percentile of the upper reference
limit (> 0.05 ng/mL correlating with myocardial injury) in association with clinical signs and electrocardiographic (EKG) findings. Data concerning the characteristics and source of the primary infection were also obtained. Mortality risk at admission was assessed using the Acute Physiological and Chronic Health Evaluation II (APACHE II) scoring method. The well-validated modified form of the Charlson Comorbidity Index method was also used to stratify patients by composite comorbidity on the basis of their documented healthcare conditions.

**Statistical Analysis**

All analyses were performed by author JB using SAS for Windows 9.4. No missing data were replaced by substitutions or interpolations. Depending on the normality distribution of data, all continuous data were described using means and standard deviations, or medians and 25th, 75th percentiles. Categorical data were described using counts and percent frequencies. Patients who survived to discharge were compared to those who died during their hospital stay. Continuous variables were examined using Wilcoxon rank sum tests. Categorical variables were examined with Chi-square tests where appropriate (expected frequency > 5 in 80% of cells), otherwise Fisher’s Exact tests were used. Odds ratios (OR) and 95% confidence intervals (CI) were calculated where possible.

**RESULTS**

During the analytic period, a total of n = 109 patients met our inclusion/exclusion criteria. 48 (44.0%) patients were male and 61 (56.0%) were female, and their predominant reported race was Caucasian 79 (72.5%). Patients’ mean age was 68 years (SD 13.6). As far as pre-existing cardiovascular diseases, 66 (60.5%) of the patients had a history of HTN, 89 (81.7%) had known history of congestive heart failure (CHF), and 53 (48.6%) had atrial fibrillation (AF). Coronary artery disease (CAD) was also reported in 35 (32.1%) of the patients.

The majority of patients reported tobacco use, 58 (59.2%). In regards to cardiac biomarkers, troponin was elevated in 58 (55.8%) of patients on admission, and the median brain natriuretic peptide (BNP) in the first 24 hours was 389 pg/ml (25th = 157, 75th = 753). A subgroup of 63 (57.8%) patients had a prior TTE on record and 53 (84.1%)
of these patients had preserved left ventricular ejection fraction (LVEF). LVEF during hospitalization was preserved in 57 (71.3%) of the 80 patients with a value reported. Median intensive care unit length of stay was five days, and median hospital stay was eight days. Mortality was quite high with 55 (50.5%) patients dying during hospitalization and 18 out of 54 (33.3%) readmitted within one month. Ten (59.6%) more sample patients died by three months and an additional one patient died at 12 months, total 60.6%. (Table 1)

Furthermore, bivariate associations of selected study measures with in-hospital mortality were performed. The presence of underlying cardiovascular diseases had a significant impact on mortality in these septic shock patients. Patients who died were more often male (p = 0.003), hypertensive (p = 0.043), had coronary (p = 0.029) and peripheral artery disease (p = 0.028). Additionally outpatient beta-blocker use (p = 0.016), any AF (p = 0.017), troponin elevation in first 24 hours (p = 0.009) troponin peak at first 24 hours (p = 0.003), and invasive mechanical ventilation (p = 0.002) were significant in patients who died. Also notable, there was an increased incidence of respiratory tract infections in this patient sample, although the highest mortality was associated with gastrointestinal infections (p = 0.011) and skin infections had the lowest mortality (p = 0.007). APACHE II scores from admission were also compared between those patients with in-hospital mortality to those patients who survived to discharge. (Tables 2 and 3)

**DISCUSSION**

Based on these results and those from earlier studies, cardiovascular compromise is a common occurrence in critically ill patients with sepsis, with its incidence rising with severity of illness, increasing age, and the increasing number of comorbidities.\(^4\)\(^,\)\(^5\) In these analyses, markers of illness severity such as multi-organ failure and hypo-perfusion and several critical care interventions (e.g., intravenous vasopressors, fluid resuscitation) were also associated with an increased in-hospital mortality.

Additionally, in this analytic sample septic shock patients with a prior cardiovascular history of HTN, CAD, CHF, AF and peripheral arterial disease had increased in-hospital mortality (p < 0.05). Those patients with a reduced LVEF had higher mortality risks, although not at statistically significant levels (p = 0.054). Based on prior
literature, arrhythmias are commonly encountered by physicians in septic shock patients as a pathophysiological compensatory response. In our analyses, overall in-hospital mortality risks were significantly influenced by presence of any type of AF. In 2014, Kuipers et al. reported that even the occurrence of a single episode of AF was associated with increased mortality, increased length of stay and a possibly increased risk of stroke in sample patients.

Our team found that the majority of patients had elevated troponin (TnI) on admission. It has been established that cardiac troponin levels correlate with the presence of left and right ventricular dysfunction on echocardiography as well as higher hospital mortality. About 85% of patients with sepsis and septic shock have detectable cardiac troponin levels using standard troponin assays. In several studies, however, troponin levels have demonstrated a variable association with mortality, as well as a correlation with the duration of hypotension and extent of vasopressor support.

In patients with sepsis and septic shock, physicians commonly see an elevated TnI level associated with increased prevalence of CAD and higher illness severity. After controlling for other clinical factors, elevations in TnI were independently associated with increased short and long-term mortality risks. In our sample of septic shock patients, we did demonstrate that elevated TnI values correlated with poor prognosis and higher mortality risks (p < 0.01).

Despite its increasingly frequent recognition, the etio-pathogenesis of troponin elevation in sepsis remains uncertain, and EKG and echocardiography in such patients rarely demonstrate ischemic changes, inducible ischemia or occlusive coronary thrombus on further stress testing or invasive testing (e.g., cardiac catheterization). Flow-limiting CAD is infrequently documented in these patients, alluding to alternate mechanisms of TnI other than an acute ischemic event.

Postulated causes for troponin elevations in septic patients include ischemic mechanisms similar to those with ischemic hepatopathy. These mechanisms include supply demand mismatch or microvascular thrombus, as well as non-ischemic mechanisms such as reversible myocardial membrane leakage of cytosolic TnT pool or direct cellular toxicity from inflammatory mediators or excessive catecholamine levels.
These analytic results demonstrate that the in-hospital mortality of septic shock patients was higher in those with prior cardiovascular history including HTN, obstructive CAD, peripheral artery disease, and underlying arrhythmias such as AF. In our analyses, patients’ mortality risks were significantly associated with elevated TnI levels, demonstrating the value and pertinence of carefully monitoring their TnI levels and recognizing non-ischemic etiologies of their elevation.

Additionally, these results demonstrate that lactic acid elevation (which is commonly used as a predictor of shock and poor outcome in shock) was not as statistically significant as troponin elevation and troponin peak in the first 24 hours (P = 0.210). This finding brings into question whether there can be a utility in sepsis tool predictors using troponin values in addition to lactic acid levels.

Our analyses have several limitations in that they were conducted with retrospective data and our sample was limited to a convenience sample of hospitalized septic shock patients in a single healthcare system. We acknowledge that we may have been inadequately powered to detect additional significant associations that might have been found from a larger sample. It is important to note that these analyses used data derived from a larger parent study that the authors are confident will lead to additional papers concerning the impact of new onset of AF in septic shock patients.

CONCLUSIONS

Troponin levels and other markers of illness severity may be triggered by profound inflammatory response particularly in patients with underlying cardiovascular disease. Elevated troponins tend to be associated with increased risk of both short and long-term mortality. Our study findings indicate that patients with history of underlying CAD and HTN who present with septic shock within the first 48 hours of admission and have TnI and other markers of inflammatory and ischemic response such as atrial fibrillation tend to have a higher mortality.

Appropriate triage and recognition of this subset of patients along with tailoring therapy to stabilize and improve cardiac dysfunction and resuscitation can potentially lead to better outcomes. Although the results from prior studies agree with this conclusion, few studies have examined outcomes of patients who receive early resuscitation with AF and
elevated troponins. Further studies focusing on adequate resuscitation within the setting of elevated troponins are certainly required. These study findings further affirm the need for an improved understanding of the underlying etio-pathogenesis and mechanisms during critical sepsis illness to impact patient outcomes and mortality.

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The authors declare no conflicts of interest.

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Accepted for publication April 2018
REFERENCES


### Table 1: Descriptive Characteristics of Sample Patients (N=109)

<table>
<thead>
<tr>
<th>Variable</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>48 (44.0%)</td>
</tr>
<tr>
<td>Race</td>
<td>N=103</td>
</tr>
<tr>
<td>White</td>
<td>79 (76.7%)</td>
</tr>
<tr>
<td>Black</td>
<td>24 (23.3%)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>Mean ± SD (median)</td>
<td>68 ± 14 (69)</td>
</tr>
<tr>
<td>Min to max</td>
<td>18 to 89</td>
</tr>
<tr>
<td>BMI*</td>
<td>27.4 (23.0, 32.8)</td>
</tr>
<tr>
<td>Min to Max</td>
<td>13 to 102</td>
</tr>
<tr>
<td>HTN *</td>
<td>66 (60.6%)</td>
</tr>
<tr>
<td>Any CHF*</td>
<td>89 (81.7%)</td>
</tr>
<tr>
<td>CAD*</td>
<td>35 (32.1%)</td>
</tr>
<tr>
<td>MI*</td>
<td>16 (14.7%)</td>
</tr>
<tr>
<td>Peripheral diseases</td>
<td>11/99 (11.1%)</td>
</tr>
<tr>
<td>Diabetes (any form)</td>
<td>33 (30.3%)</td>
</tr>
<tr>
<td>CVA*</td>
<td>23 (21.3%)</td>
</tr>
<tr>
<td>COPD*</td>
<td>43 (39.5%)</td>
</tr>
<tr>
<td>CKD III*</td>
<td>32 (29.4%)</td>
</tr>
<tr>
<td>ESRD</td>
<td>10 (9.2%)</td>
</tr>
<tr>
<td>Pre-Admission Beta Blocker</td>
<td>49 (45.0%)</td>
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<tr>
<td>Pre-Admission Calcium Channel Blockers</td>
<td>12 (19.3%)</td>
</tr>
<tr>
<td>Tobacco use</td>
<td>58/98 (59.2%)</td>
</tr>
<tr>
<td>SI resp*</td>
<td>56 (51.4%)</td>
</tr>
<tr>
<td>SI GI</td>
<td>18 (16.5%)</td>
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<tr>
<td>SI GU</td>
<td>29 (26.6%)</td>
</tr>
<tr>
<td>SI bone</td>
<td>3 (2.8%)</td>
</tr>
<tr>
<td>SI skin</td>
<td>13 (11.9%)</td>
</tr>
<tr>
<td>SI unclear</td>
<td>5 (4.6%)</td>
</tr>
<tr>
<td>SI blood</td>
<td>19 (17.4%)</td>
</tr>
<tr>
<td>Any AF *</td>
<td>53 (48.6%)</td>
</tr>
<tr>
<td>Serum albumin &lt; 3.5 g/dl</td>
<td>97 (89.0%)</td>
</tr>
<tr>
<td>Admission hemoglobin &lt;10</td>
<td>45 (41.3%)</td>
</tr>
<tr>
<td>Troponin elevated in the first 24 hours</td>
<td>58/104 (55.8%)</td>
</tr>
<tr>
<td>Cardiovascular Factors Associated with Septic Shock Mortality Risks</td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Peak troponin 24h</td>
<td>N=104</td>
</tr>
<tr>
<td>Median (25th, 75th)</td>
<td>Min to Max</td>
</tr>
<tr>
<td>Admission ventricular response&gt;110</td>
<td>50 (45.9%)</td>
</tr>
<tr>
<td>EF* prior to hospitalization</td>
<td>N=63</td>
</tr>
<tr>
<td>&lt;35%</td>
<td>6 (9.5%)</td>
</tr>
<tr>
<td>35-45%</td>
<td>4 (6.4%)</td>
</tr>
<tr>
<td>&gt;45%</td>
<td>53 (84.1%)</td>
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<tr>
<td>EF during hospitalization</td>
<td>N=80</td>
</tr>
<tr>
<td>&lt;35%</td>
<td>15 (18.8%)</td>
</tr>
<tr>
<td>35-45%</td>
<td>8 (10.0%)</td>
</tr>
<tr>
<td>&gt;45%</td>
<td>57 (71.3%)</td>
</tr>
<tr>
<td>Valvulopathy</td>
<td>N=41</td>
</tr>
<tr>
<td>Mild</td>
<td>14 (34.1%)</td>
</tr>
<tr>
<td>Moderate</td>
<td>23 (56.1%)</td>
</tr>
<tr>
<td>Severe</td>
<td>4 (9.8%)</td>
</tr>
<tr>
<td>Mechanical ventilation</td>
<td>73 (67.0%)</td>
</tr>
<tr>
<td>BNP*</td>
<td>N=64</td>
</tr>
<tr>
<td>Median (25th, 75th)</td>
<td>389 (157, 753)</td>
</tr>
<tr>
<td>Min to Max</td>
<td>18 to 8000</td>
</tr>
<tr>
<td>APACHE II*</td>
<td></td>
</tr>
<tr>
<td>Median (25th, 75th)</td>
<td>20 (15, 26)</td>
</tr>
<tr>
<td>Min to Max</td>
<td>8 to 45</td>
</tr>
<tr>
<td>Charlson Index (age adjusted)</td>
<td>7</td>
</tr>
<tr>
<td>Median (25th, 75th)</td>
<td>7 (4, 9)</td>
</tr>
<tr>
<td>Min to Max</td>
<td>0 to 19</td>
</tr>
<tr>
<td>ICU* length of stay (days)</td>
<td></td>
</tr>
<tr>
<td>Median (25th, 75th)</td>
<td>5 s(3, 10)</td>
</tr>
<tr>
<td>Min to Max</td>
<td>1 to 32</td>
</tr>
<tr>
<td>Hospital length of stay (days)</td>
<td></td>
</tr>
<tr>
<td>Median (25th, 75th)</td>
<td>8 (4, 13)</td>
</tr>
<tr>
<td>Min to Ma</td>
<td>1 to 35</td>
</tr>
<tr>
<td>In-hospital death</td>
<td>55 (50.5%)</td>
</tr>
<tr>
<td>Died within three months</td>
<td>65 (59.6%)</td>
</tr>
<tr>
<td>Died within one year</td>
<td>66 (60.6%)</td>
</tr>
<tr>
<td>Readmission within one month</td>
<td>18/54 (33.3%)</td>
</tr>
</tbody>
</table>

Table 2: Bivariate Associations with In-hospital Mortality**

<table>
<thead>
<tr>
<th>Variable</th>
<th>In-hospital Survival (N= 54)</th>
<th>In-Hospital Mortality (N= 55)</th>
<th>P-value</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>16 (29.6%)</td>
<td>32 (58.2%)</td>
<td><strong>0.003</strong></td>
<td>3.30 (1.50, 7.30)</td>
</tr>
<tr>
<td>Race</td>
<td>N=52</td>
<td>N=51</td>
<td>0.18</td>
<td>0.53 (0.21, 1.35)</td>
</tr>
<tr>
<td>White</td>
<td>37 (71.2%)</td>
<td>42 (82.4%)</td>
<td>0.061</td>
<td>1.39 (1.03, 1.87)</td>
</tr>
<tr>
<td>Black</td>
<td>15 (28.9%)</td>
<td>9 (17.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age Mean ± SD (median)</td>
<td>65 ± 15 (66)</td>
<td>71 ± 11 (71)</td>
<td>0.061</td>
<td>1.39 (1.03, 1.87)</td>
</tr>
<tr>
<td>Min to max</td>
<td>18 to 89</td>
<td>46 to 88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI* Median (25th, 75th)</td>
<td>28.7 (21, 36)</td>
<td>26.7 (24, 32)</td>
<td>0.48</td>
<td>0.97 (0.93, 1.01)</td>
</tr>
<tr>
<td>Min to Max</td>
<td>13 to 102</td>
<td>17 to 54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HTN*</td>
<td>26 (48.2%)</td>
<td>40 (72.7%)</td>
<td><strong>0.009</strong></td>
<td>2.87 (1.29, 6.38)</td>
</tr>
<tr>
<td>Any CHF*</td>
<td>40 (74.1%)</td>
<td>49 (89.1%)</td>
<td><strong>0.043</strong></td>
<td>2.86 (1.01, 8.12)</td>
</tr>
<tr>
<td>CAD*</td>
<td>12 (22.2%)</td>
<td>23 (41.8%)</td>
<td>0.029</td>
<td>2.52 (1.09, 5.80)</td>
</tr>
<tr>
<td>MI*</td>
<td>6 (11.1%)</td>
<td>10 (18.2%)</td>
<td>0.3</td>
<td>1.78 (0.60, 5.29)</td>
</tr>
<tr>
<td>Peripheral diseases</td>
<td>2 (42.5%)</td>
<td>9 (16.7%)</td>
<td><strong>0.028</strong></td>
<td>5.16 (1.05, 25.3)</td>
</tr>
<tr>
<td>Diabetes (any)</td>
<td>12 (22.2%)</td>
<td>18 (32.7%)</td>
<td>0.57</td>
<td>1.26 (0.56, 2.87)</td>
</tr>
<tr>
<td>CVA*</td>
<td>9 (16.7%)</td>
<td>14/54 (25.9%)</td>
<td>0.24</td>
<td>1.75 (0.68, 4.48)</td>
</tr>
<tr>
<td>Outpatient beta blocker</td>
<td>18 (33.3%)</td>
<td>31 (56.4%)</td>
<td><strong>0.016</strong></td>
<td>2.58 (1.19, 5.62)</td>
</tr>
<tr>
<td>Any AF*</td>
<td>20 (37.0%)</td>
<td>33 (60%)</td>
<td><strong>0.017</strong></td>
<td>2.55 (1.18, 5.52)</td>
</tr>
<tr>
<td>Tobacco</td>
<td>27/49 (55.1%)</td>
<td>31/49 (63.3%)</td>
<td>0.41</td>
<td>1.40 (0.63, 3.15)</td>
</tr>
<tr>
<td>SI* resp</td>
<td>26 (48.2%)</td>
<td>30 (54.6%)</td>
<td>0.5</td>
<td>1.29 (0.61, 2.74)</td>
</tr>
<tr>
<td>SI GU*</td>
<td>4 (7.4%)</td>
<td>14 (25.5%)</td>
<td><strong>0.011</strong></td>
<td>4.27 (1.30, 14.0)</td>
</tr>
<tr>
<td>SI bone</td>
<td>1 (1.9%)</td>
<td>2 (3.6%)</td>
<td>1</td>
<td>2.00 (0.18, 22.7)</td>
</tr>
<tr>
<td>SI skin</td>
<td>11 (20.4%)</td>
<td>2 (3.6%)</td>
<td><strong>0.007</strong></td>
<td>0.15 (0.03, 0.70)</td>
</tr>
<tr>
<td>SI unclear</td>
<td>3 (5.6%)</td>
<td>2 (3.6%)</td>
<td>0.68</td>
<td>0.64 (0.10, 4.00)</td>
</tr>
<tr>
<td>SI blood</td>
<td>8 (14.8%)</td>
<td>11 (20.0%)</td>
<td>0.48</td>
<td>1.44 (0.53, 3.91)</td>
</tr>
<tr>
<td>Serum albumin &lt; 3.5 g/dl</td>
<td>46 (85.2%)</td>
<td>51 (92.7%)</td>
<td>0.21</td>
<td>2.22 (0.63, 7.85)</td>
</tr>
<tr>
<td>Admission hemoglobin &lt;10</td>
<td>22 (40.7%)</td>
<td>23 (41.8%)</td>
<td>0.91</td>
<td>1.05 (0.49, 2.24)</td>
</tr>
<tr>
<td>Troponin elevated in the first 24 hours</td>
<td>20/51 (39.2%)</td>
<td>38/53 (71.7%)</td>
<td><strong>0.0009</strong></td>
<td>3.93 (1.73, 8.92)</td>
</tr>
<tr>
<td>Peak troponin 24h Median (25th, 75th)</td>
<td>N=51 0.04(04,10)</td>
<td>N=53 0.21(04,1.72)</td>
<td><strong>0.0003</strong></td>
<td>NA</td>
</tr>
<tr>
<td>Min to Max</td>
<td>0.04 to 25.46</td>
<td>0.04 to 100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiovascular Factors Associated with Septic Shock Mortality Risks</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>---------------------------------------------------------------</td>
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<tr>
<td>Admission ventricular response $&gt;$110</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>26 (48.2%)</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>24 (43.6%)</td>
<td></td>
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<tr>
<td>0.64</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>0.83 (0.39, 1.77)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>EF* during hospitalization</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>N=37</td>
<td>N=43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;35%</td>
<td>3 (8.1%)</td>
<td>12 (27.9%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35-45%</td>
<td>3 (8.1%)</td>
<td>5 (11.6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;45%</td>
<td>31 (83.8%)</td>
<td>26 (60.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical ventilation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27 (50.0%)</td>
<td>46 (83.6%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0002</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.11 (2.10, 12.5)</td>
<td></td>
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</tr>
</tbody>
</table>

*BMI-body mass index, HTN-hypertension, CHF-congestive heart failure, CAD-coronary artery disease, MI-myocardial infarction, CVA-cerebrovascular accident, AF-atrial fibrillation, SI-source of infection, GI-gastrointestinal, GU-genitourinary, EF-ejection fraction

**Please direct any and all questions regarding table specifics to the corresponding author**
### Table 3:
Continuous Variables comparing Patients Surviving to Discharge to those Dying In-hospital.

<table>
<thead>
<tr>
<th>Variable</th>
<th>In-hospital Survival (N= 54)</th>
<th>In hospital Mortality (N= 55)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak lactic acid/24hmmol/L</td>
<td>2.9 (1.8, 4.4) 0.3 to 21</td>
<td>3.6 (2.0, 5.8) 0.7 to 22.5</td>
<td>0.21</td>
</tr>
<tr>
<td>Median (25th, 75th) Min to Max</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BNP* peak 24h (pg/ml)</td>
<td>N=27 241 (79, 747) 18 to 4000</td>
<td>N=37 478 (260, 1222) 20 to 8000</td>
<td>0.10</td>
</tr>
<tr>
<td>Median (25th, 75th) Min to Max</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>APACHE II * 6</td>
<td>18 (14, 24) 8 to 38</td>
<td>21 (17, 28) 10 to 45</td>
<td><strong>0.009</strong></td>
</tr>
<tr>
<td>Median (25th, 75th) Min to Max</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charlson Comorbidity Score 7</td>
<td>6.5 (4, 9) 0 to 19</td>
<td>8.0 (5, 10) 0 to 15</td>
<td>0.07</td>
</tr>
<tr>
<td>Median (25th, 75th) Min to Max</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*BNP-brain natriuretic peptide,
APACHE-acute physiology and chronic health evaluation
The Statewide Campus System Scholarly Activity Developmental Planning Framework for Community-Based GME Leaders

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ABSTRACT

CORSER W, CHURCH B, ROHRER J, HORTOS K. The Statewide Campus System Scholarly Activity Developmental Planning Framework for Community-Based GME leaders. Spartan Med. Res. J. Vol. 3, No. 1, pp. 67-83, 2018. CONTEXT: During recent years, Graduate Medical Education (GME) leaders in the United States of America have witnessed many substantive changes, including movement to a single accreditation system under the Accreditation Council for Graduate Medical Education. Both MD- and DO-trained residents and faculty must now meet an increasingly stringent set of accreditation standards outlined in Next Accreditation System standards. Specifically, updated scholarly activity standards emphasize a consistent volume and quantity of quality improvement/research projects and dissemination products. The GME literature to date has frequently provided general commentaries regarding individual project strategies or oriented to settings with greater project-related resources. There have also been few articles offering scholarly activity planning strategies for community-based GME officials striving to increase scholarly activity levels. PROPOSED PLANNING FRAMEWORK: The authors propose a customizable assessment-planning framework, largely derived from their combined decades of consultation experiences with hundreds of community-based resident and faculty projects. The authors will first describe the primary elements of their proposed scholarly activity planning approach for GME leaders so often subject to worsening resource constraints. They will describe six ongoing developmental strategies with several exemplars described. Such a framework will likely require ongoing reassessments and modification. CONCLUSIONS: The authors hope that this proposed planning framework will offer GME administrators, faculty and residents with a pragmatic set of strategies to develop scholarly activity projects and supports. Ideally, GME leaders can use this approach to inform their design of a sustainable system-customized infrastructure of scholarly activity supports. Keywords: scholarly activity, graduate medical education, community-based

INTRODUCTION

During recent years, the nation’s graduate medical education (GME) leaders in the United States have witnessed substantive changes, including movement to a single
accreditation system under the Accreditation Council for Graduate Medical Education (ACGME). Both MD and DO-trained resident and faculty physicians must now meet an increasingly stringent set of accreditation standards outlined in Next Accreditation System (NAS) standards.¹

One particular standard that many GME authors have struggled to address relates to the enhanced requirements for scholarly activity (SA) projects.²⁻⁸ These types of research or quality improvement/patient safety (QIPS) projects are generally conducted to improve GME educational processes, patient care outcomes, provider effectiveness, etc.²⁻⁵,⁷ In this paper, the authors will use the abbreviation SA to refer to both research and systems-oriented QIPS designs. Although both academic and community-based GME physicians contend with increasing resource constraints, a growing number of authors have contended that these types of challenges may be greater (or certainly different) in community-based GME settings.⁹⁻¹⁴

Unfortunately, GME officials still lack a uniform definition of what comprises a minimal level of SA.³,⁸ Still, the ACGME has released two initial files to guide GME leaders. The first was a 2009 non-validated metrics point system for GME officials and accreditation reviewers gauging resident and faculty SA productivity levels.¹⁵ Second, a specialty-specific set of SA measurement parameters for residents and fellows was last updated in later 2017.¹⁶ However, ACGME expectations for SA continue to vary significantly across clinical specialty groups.⁴⁻⁵,¹²

More GME experts have concluded that community-based physicians may typically experience greater difficulty planning and conducting SA projects due to fewer available resources (e.g., library staff, data-capable personnel, analytic experts).¹²,¹⁷⁻²⁰ Most of the SA literature to date appears to be aggregated primarily within two categories. The first, consists of fairly general commentaries.¹⁻³,¹¹,²²,²³ The second is restricted to academic settings concluded to possess greater project resources.⁸,²³⁻³³ A growing number of GME authors have called for pragmatic planning strategies geared for community-based leaders striving to address increased SA expectations.⁴⁻⁶,⁸,²⁰,²¹,²⁶⁻²⁸,³³,³⁴ In response, the purpose of this paper will be to propose a detailed and customizable planning framework for GME leaders who are working to increase the level of SA at their community-based hospitals.
Some GME authors have implemented SA resident teams, generally comprised of residents from multiple programs with complementary SA project interests. Annual residency sequences have been used to equip earlier-year residents with project skills needed to eventually lead their own SA projects. Similar to what the Michigan State University Statewide Campus System (SCS) authors have seen in affiliated systems, SA councils/committees can also coordinate individual resident and faculty-resident projects.

GME administrators have appointed later-year residents to chief research/QIPS resident positions to coordinate SA projects in some settings. Protected time resident rotations with QIPS department personnel may help them generate ideas for later SA projects. Somewhat similar to the ACGME points system, some residency program officials have created customized scoring systems to track residents' SA productivity.

Many authors have argued that any such mechanisms need to be modified due to system or program-specific influences, and that a standardized rollout approach is unlikely to work across diverse GME settings. For example, the SCS authors and others have described overt discomfort/resistance from some faculty expected to mentor residents during SA project design and conduction activities. In fact, more recently-trained residents may be more functionally prepared to conduct SA projects than their clinically-experienced faculty. Other setting constraints may include inadequate time, or uncertainty concerning readily available resources.

Numerous experts have already shown that customized SA planning tools (e.g., systematic needs assessment forms, planning templates, annual resident checklists and timelines, etc.) can help facilitate SA project development. However, the authors of this paper will propose that a more comprehensive set of customizable SA strategies is generally required to augment system-specific project resources over time.

The SCS authors have developed this comprehensive planning approach from their 2016-2017 experiences consulting on over 210 (i.e., over 1,670 consultation hours to date, mean of 7.95 hours per project (range from 1 to 52 hrs.) community-based SA projects. Resident and faculty project leaders have requested SA consultations from
many of the 190+ SCS-affiliated residency programs based at 37 healthcare systems. This paper will: a) describe the key elements of the authors’ suggested SA developmental planning approach, and b) discuss six non-sequential and ongoing strategies to enable community-based GME leaders to facilitate increased SA levels. The authors will also describe several exemplary settings with ongoing SA infrastructure developments.

**SCHOLARLY ACTIVITY DEVELOPMENTAL FRAMEWORK**

The first goal of this proposed SA planning framework is to provide community-based GME leaders with a specific set of criteria to assess their current in-house project resources and complexities. The authors propose that this approach will prove especially important for GME officials striving to first develop or improve their SA project supports. The authors have repeatedly seen that many community-based leaders’ success in increasing their SA levels have required a broader perspective than simply completing a series of individual projects and dissemination products. In this paper, they assert that the longer-term development of a sustainable SA infrastructure of project supports will prove integral for maintaining SA productivity in lesser-resourced GME settings.

The key elements of this planning framework (see Figure 1) are largely derived from the authors’ successful workshop, online module and individual consultation experiences with community-based GME leaders. They have concluded that many faculty and residents develop idealized (i.e., often unfeasible) projects without capitalizing on on-site resources, and/or conduct projects without the *lessons learned* from earlier SA projects in their healthcare system. GME experts have increasingly supported this broader type of ongoing self-learning model of SA development that entails ongoing reassessments and modification efforts. The *stop and start* approach to SA will impede the development of a sustainable SA project support infrastructure so later project leaders may feel as if they are *starting from scratch*.

Referring to the upper-left of Figure 1, an effective SA support infrastructure should be oriented toward first developing projects that specifically capitalize on available specific resources, such as institutional review board (IRB) guidance, health library and data-capable personnel, and QIPS/department personnel. SA support
infrastructure should also be compatible with GME cultural realities: Faculty and resident SA attitudes and beliefs, varied specialty perspectives, perceived availability of project supports and mentoring.\textsuperscript{14,55,65,68-71}

Referring to the middle of Figure 1, certainly each SA project will need to be developed within the context of each project team’s competing role demands (e.g., patient care commitments, committee work, etc.).\textsuperscript{5,14,19,26,34,50} Ideally, any initially available project-related resources will be sufficient for earlier SA projects, although subsequent project designs can capitalize on better organized resources.

Referring to the right of Figure 1, over time, both the volume and quality of SA projects and dissemination products (e.g., posters, podium presentations and publications) can be expected to increase and GME leaders may be able to realistically expect that improved SA levels will eventually impact patient care processes and outcomes.\textsuperscript{20,31,57,60,72-75}

**Developmental SA Strategies**

The following ongoing developmental strategies are encouraged for community-based GME leaders striving to attain an organized SA project support infrastructure:

- **Periodically assess your project planners’ SA learning needs and preferences by promoting available resources in an ongoing manner.**

  It is also been shown to be necessary to periodically gauge the key learning needs of faculty and residents concerning SA projects.\textsuperscript{4,12,14,19,23,58,76} This information can be obtained through learner surveys and/or initial project planning discussions reviewing project planning materials with project leaders.\textsuperscript{21,41,49} For example, the authors and others have consistently found that project planners from different clinical specialties (e.g., primary care versus surgical specialties) tend to first prioritize different aspects of project development (e.g., evaluating project feasibility, selection of measures, or data set/analytic preferences).\textsuperscript{55,58,77,78}

  The SCS authors have generally concluded that many primary care physicians tend to prefer GME or QIPS project designs than surgical/procedure-oriented clinicians more oriented to complex research designs (e.g., randomized controlled trials).\textsuperscript{42,58} If found to be present in a leader’s GME setting, these SA project orientations can be incorporated into project planning materials for different learner groups.\textsuperscript{8,58}
GME leaders can certainly improve perceptions of available SA project resources by purposefully disseminating information concerning library, electronic health record and QIPS department materials and resources.\textsuperscript{6, 11, 26, 47, 48, 66, 72} The systematic in-house compilation of project planning materials (e.g., \textit{Plan-Do-Check-Act} planning sheets, pertinent articles, project conduction checklists, etc.) can prove key for first meeting the needs and preferences of lesser experienced project learners.\textsuperscript{11, 26, 47, 48, 72}

GME officials should also periodically consider how their respective IRB have been distinguishing different types of SA projects by perceived level of research risks or types of suggested IRB applications (i.e., \textit{non-human subjects, exempt, expedited, full review}).\textsuperscript{60, 65, 72} The authors' have routinely encouraged project developers to sit down with their system IRB contact person when considering initial project design options.\textsuperscript{56} The suggestions from an IRB contact and even the manner in which IRB application forms are formatted may provide novice project planners with additional guidance.\textsuperscript{58, 63}

- **Orient your project planners to a targeted set of feasible project topics.**

It may become necessary to limit SA project developers to a focused set of topic areas during their preliminary project planning.\textsuperscript{31, 36, 65} This step can facilitate: a) faculty project mentoring, b) identification of project topics, and c) help project leaders recruit others to participate.\textsuperscript{31, 54} Guiding novices with more feasible project topics can help reserve the use of personnel with specialized project skill resources (e.g., qualitative or quantitative analytic skills, extracting secondary EHR chart data, etc.).\textsuperscript{38, 39, 48, 58, 79}

It is especially important for SA leaders to consider that GME and QIPS-oriented projects generally involve less \textit{protected health information} and will be more rapidly IRB approved.\textsuperscript{2, 41, 72, 80} These types of projects generally entail less work than projects requiring patient recruitment, consenting and follow up contacts. Although GME and QIPS projects may not be as immediately appealing to novices with grandiose project visions, they may prove easier to monitor for GME faculty and officials.\textsuperscript{18, 29, 41, 42, 80}

- **Strategically engage current/prospective project “champions.”**

GME officials will often need to politically activate and engage a subset of project champions to generate an ongoing critical mass of SA momentum.\textsuperscript{26, 30, 35, 58, 59, 68, 76-78, 81, 82} Increased physician interest in project participation can be generated from project
planning workshops with champions present and overtly promoting successful SA project results in newsletters/announcements.8,11,58,73

One training mechanism that the SCS authors have twice used is the American Association of Medical College’s “Teach for Quality” (Te4Q) program.83 During the SCS offering of this program offering, a cohort of affiliated GME faculty were mentored over a 13 to 15-month period to design, conduct and disseminate the results of their SA projects.81 The purposeful selection of capable faculty for this type of structured training program can be vital since prospective applicants may have varying levels of experience, motivation and within-system support from already busy faculty and residents.23,35,40

One exemplar Te4Q learner was an emergency medicine physician who completed the program in 2016 after testing a QIPS curriculum with his senior chief resident.42 After the program, he adjusted his curriculum for second-year residents developing QIPS and GME-oriented projects with assigned faculty mentors. Individual projects entailed topics such as surveying residents and faculty concerning aspects of their overall GME experiences, testing the pre-post learner impact of GME workshops, and examining the impact of modified pneumonia order set outcomes.

He had subsequently delivered this curriculum to two cohorts of residents with little SCS support. His curriculum-related projects have subsequently contributed at least a dozen regional/national resident poster presentations and two SA publications to date.42,84 At the same time, however, the SCS authors have still been consulted for faculty and resident SA project services in other residency programs within this same system. The authors have confirmed the following dissemination products from 2015-2017 Te4Q participants to date: a) 24 local/regional project posters, b) eight statewide posters, c) nine national posters, d) 14 statewide or national podium presentations, e) one (successful) grant proposal application, and f) one poster conference award.

- **Systematically embed SA planning activities into your pre-existing GME processes/groups.**

The GME literature contains a growing number of examples of how SA experts have incorporated project planning/evaluation activities into their current GME program/staff meetings.10,42,59,60,70 Residency program leaders may choose to periodically assign
review and discussion of novices’ SA project planning drafts or draft manuscripts during scheduled faculty/resident meetings.8,42,58,77

This approach may help SA activities become perceived as a regular part of doing business in the minds of more residents and faculty.18,31,50 Implementing such sequences into pre-existing GME activities may serve to improve both the quality of IRB applications and submission journal drafts, as well as enable novices to become more accustomed to receiving and exchanging critical feedback.8,42,77

- **Conduct a postmortem evaluation of every SA project and attempt to derive pragmatic system-specific knowledge for future projects.**

GME officials may underestimate the impetus for future projects potentially derived from completed SA projects.13,41,42 Experiences derived from most SA projects can serve to inform what projects may, or may not, work in a specific GME environment/healthcare system. The authors have sometimes conveyed a football coach analogy to GME officials striving to strengthen their SA team over several years by evaluating SA project successes and lessons. This routine practice of informing project novices about earlier project successes/failures may be integral for them to develop system-compatible projects. It is also unrealistic to expect a subset of residency programs or personnel to conduct most ongoing SA projects.11,41,85 GME leaders may wish to implement some type of writing mentor mechanisms since the responsibility of project leaders to report their community-based results in the GME literature remains increasingly important.8,14,59

The growing complexities of publishing one’s final project results in many GME journals due to increased article processing fees and greater publication competition certainly needs to be acknowledged.10,58,64 GME officials may need to routinely attempt to moderate the expectations of somewhat traumatized project authors after their initial paper submissions are rejected.4,27,38,58 The compilation of publicly accessible scholarly writing tip sheets and tutorials may therefore be appreciated since most GME settings continue to lack internal paper editing, formatting and submission resources.

- **Consider how to attain maximal SA efficiencies in your GME environment.**

Since many community-based GME leaders continue to experience worsening resource constraints, it may only be realistic to offer workshop/training content through coordinated asynchronous and online mechanisms.17,81,85-89 For example, the first author
developed a series of 12-to-22-minute QIPS modules in 2016 for online delivery to statewide affiliated learners using Desire To Learn online course management software. Module topics included: a) QIPS in Healthcare: Origins and Principles, b) Research and QIPS: Differences and Similarities, c) Feasible Project Design Strategies, d) Preparing your IRB Application, and e) Building a Program of Scholarly Activity as a GME Leader. Between January 2016 and March 2018, 87 users have been enrolled and made over 280 group/individual module hits.

A growing number of GME experts have also indicated that it may become increasingly impractical for individual settings or programs to achieve sustainable SA progress without some type of intuitional/consortium coordination. The SCS authors have been regularly assured by community-based colleagues that they experience increased pressures to maximize the efficiency of their programs and activities as their respective systems have continued to trim resources based on decreased patient care and GME revenue streams.

CONCLUSIONS

There will never likely be any standardized solutions for development of sustainable project support SA infrastructures across our nation’s diverse GME settings.

This paper presents a non-sequential developmental planning approach comprised of strategies for community-based GME officials striving to address emerging accreditation standards. As GME setting conditions change, leaders’ implemented SA project supports may require ongoing trial and error adjustments. Ideally, this proposed developmental framework can be applied to help meet the diverse SA needs of our nation’s community-based GME environments.

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Figure 1
The Statewide Campus System Scholarly Activity Planning Framework for Community-based GME Leaders

W Corser et al.
http://smrj.msu.edu
Spartan Med Res J
Retro-Odontoid Pseudotumor with Cervical Medullary Compression: A Case Report

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ABSTRACT

ELFALLAL W, ELFALLAL S. Retro Odontoid Pseudo Tumor with Cervical Medullary Compression: A Case Report. Spartan Med. Res. J. Vol. 3, No. 1, pp. 84-93, 2018. CONTEXT: A retro odontoid pseudo tumor is a mass lesion lying posterior to the odontoid process along the dura. It is a disease process seen in inflammatory and non-inflammatory conditions causing chronic atlanto-axial instability. This type of mass has the potential to enlarge causing cervicomedullary compression and symptoms of myelopathy. In the past, authors have relied on a more invasive, direct approach to decompress the mass including an anterior trans oral odontoidectomy and a posterior trans-dural resection. The objective of this case report is to describe the use of an indirect approach, cervical fusion with decompressive laminectomy, to successfully treat a retro odontoid pseudo tumor in a geriatric patient. METHODS: A male patient in his late 90's presented with inability to ambulate, global paresis, and long tract signs in the upper extremities. He was found to have a large odontoid mass with compression at the cranio-cervical junction. He underwent cervical fusion with instrumented fixation from C1-6 and decompressive laminectomy from C4-6. RESULTS: Over a follow-up period of two years, there was improvement in the patient's motor weakness and ambulation. Radiographic evaluation at the two-year mark showed marked reduction in pannus size. CONCLUSIONS: Indirect approaches to decompression in patients with retro odontoid pseudo tumor using techniques such as cervical fusion may be a safe for effective treatment in patients of advanced age, with multiple co-morbidities, and inability to tolerate lengthy surgical procedures. Keywords: retro odontoid pseudo tumor, pannus

INTRODUCTION

Retro odontoid pseudo tumor is a disease entity characterized by a mass lesion lying posterior to the odontoid process (the upward protuberance of the C2 vertebrae, or dens) and resting along the dural sheath outside of the spinal cord. This retro odontoid mass may also be referred to as an odontoid pannus or phantom tumor. 1 Over time, it
may enlarge, causing cervicomedullary compression due to proximity to the spinal cord at the level where the cervical spinal cord and brainstem meet. This may lead to myelopathy, a clinical syndrome defined by neurologic deficit arising from the spinal cord. In this case, the neurological symptoms were from extrinsic compression of the spinal cord at the cervicomedullary junction.²

This clinical syndrome can comprise a diverse set of symptoms including sensory, motor, and dexterity changes of the upper and lower limb, unstable gait, and urinary retention due to chronic spinal cord compression.³ In rare instances (as seen in this case), there may be development of pannus-related cysts leading to further compression of the upper spinal cord and lower medulla.

In the past, authors have suggested treatment of the odontoid pannus through a trans-oral approach with direct removal and decompression.⁴ More recently, surgeons have trended towards upper cervical spinal fusion with or without laminectomy for indirect decompression and treatment of the pannus.⁵ Patients with inflammatory and non-inflammatory conditions causing chronic atlanto-axial instability including rheumatoid arthritis, Down syndrome, Os-odontoideum, and Morquio syndrome are at high risk for development of these retro-odontoid masses.⁶

The early recognition of cervical myelopathy in the setting of odontoid pseudo tumor along with prompt surgical evaluation can reduce morbidity and improve spinal cord compression outcomes. In addition, early intervention is crucial in helping patients preserve their baseline functional status.⁷

METHODS

Case Report:

A man in his late 90's presented to the authors' neurosurgical service with an inability to ambulate. Detailed neurologic exam revealed global paresis, or weakness, of the upper and lower extremity, and atrophy of the intrinsic hand muscles with long tract signs noted in the upper extremity. In addition, this patient had global hyperreflexia and lower extremity spasticity. The authors noted no lower cranial nerve palsies on his examination and his mental status was normal. Bedsores were found on his heels along
with a sacral ulcer. Overall, the patient had poor physical health largely due to his lack of physical activity and wheelchair-bound state.

After his work-up was completed, the patient was found to have large odontoid pannus causing compression at the cranial cervical junction. We also noted a cyst associated with this pannus causing significant mass effect on the medulla (Figure 1 E). On MRI, this produced a T2 hyperintense signal at the medulla consistent with encephalomalacia, or medullary atrophy (Figure 1 A). The patient also had diffuse spondylosis, or degeneration, of the cervical spine along with central stenosis at the C4-5 and C5-6 level (Figure 1 C). Both an MRI of brain and CT angiogram were obtained and failed to reveal any other pathology. The posterior odontoid mass was found to be due to his rheumatoid arthritis.

Interventions:

The authors had a long discussion with the patient and family in view of his advanced age and the risks of proceeding with surgery. Their primary surgical goal was to improve both his functional status and activities of daily living. Given his significant decline in functional status leaving him wheelchair-bound with high morbidity risks and poor quality of life, it was decided that the benefits of intervention outweighed the risks. The patient was medically optimized prior to surgery with full cardiac evaluation and clearance to decrease perioperative risk. His clinical presentation, physical exam findings, and pre-operative imaging were suggestive of compression of both the lower medulla and cervical spine and so we elected to complete a multi-level laminectomy.

The patient would undergo posterior cervical arthrodesis, or fusion, with instrumented fixation from C1-6 with decompressive laminectomy (removal of the lamina to relieve pressure on the spinal cord and nerves) from C4-6 to treat associated stenosis, or narrowing of the spinal canal. Intraoperative neuromonitoring was utilized along with fluoroscopy for localization and lateral mass screw placement. The authors utilized an arterial line and a large bore 16-gauge intravenous catheter in the antecubital fossa to ensure adequate access for fluids and blood pressure monitoring. No signal changes were noted intraoperatively and patient was successfully extubated.
A post-operative CT scan is provided (Figure 1 D). The patient was placed in the ICU for post-operative monitoring. He tolerated the procedure well and his hospital course was uncomplicated. He was discharged in stable condition for a short course of inpatient rehabilitation.

RESULTS

The patient was followed up for two years. There was improvement in his motor weakness symptoms and he was eventually able to ambulate without an assisted device. Radiographic evaluation at the two-year follow-up mark showed marked reduction in the pannus and associated cyst with resolution of T2 hyperintense signal within the medulla (Figures 1 B, F). While there are reports in the surgical literature of smaller-sized pannus causing cervical spinal cord compression, we have been unable to identify any reports of such a large odontoid pannus with associated cyst and medullary compression.18

DISCUSSION

Retro odontoid pseudo tumor or odontoid pannus can be seen in inflammatory disease entities such as rheumatoid or psoriatic arthritis, and in the non-inflammatory settings (e.g., chronic dialysis, post-traumatic pseudo arthrosis, and degenerative disease).5 This mass sitting posterior to the odontoid process can be formed from different etiologies. The primary proposed mechanism is chronic atlanto-axial instability that leads to the development of this type of pannus. Authors have defined Atlanto-Axial instability using radiographic measurements of the atlas–dens interval (ADI). If the ADI is greater than 4 mm. with flexion on cervical spine x-rays, it is considered unstable.9 This instability leads to non-physiologic motion producing an inflammatory process with fibrocartilaginous mass formation in the posterior odontoid space which over time can lead to direct spinal cord compression.10

However, there are a few instances where no atlantoaxial instability is noted on imaging and yet there still may be development of this mass lesion.9 In our case, this patient had an underlying inflammatory spondyloarthropathy, but was under no active treatment. In general, the overall incidence of this condition is unknown, although a recent 11-year case series review found that incidence of retro odontoid pannus in patients with
symptomatic atlanto-axial instability with associated risk factors including rheumatoid arthritis, os-odontoidum, dens fracture and Morquio syndrome was 23.2%.\textsuperscript{6}

In the past, authors have recommended a direct form of decompression with removal of the odontoid pannus. Surgical treatments included anterior trans oral odontoidectomy and posterior transdural resection. However, these surgical approaches have been associated with higher infection rates, spinal cord injury and in some instances reoccurrence of the mass.\textsuperscript{11} More recently, it has been proposed to surgically fuse the posterior spine, primarily at the C1 to C2 junction.

Authors have reported good radiographic and clinical outcomes one case report with complete resolution or reduction in mass size over a 45-month period, obviating the need for a transoral anterior approach.\textsuperscript{5} In this patient’s case, fusion not only included C1 and C2 vertebrae, but was extended to the lateral masses of C6. Decompressive laminectomy was completed at the C4 to C6 levels to treat the associated central canal stenosis. Our surgical intervention for this elderly man showed a good outcome with resolution of the pannus compression on the medulla and radiographic reduction of the mass.

We also elected this approach to reduce surgical risk and morbidity associated with surgery. The use of C1-2 fusion is a known safe treatment for atlanto-axial instability and has been extended as a treatment for painful arthritis.\textsuperscript{12} Some authors have even recommended occipital cervical fusion to treat associated occipital cervical instability and adjacent segment disease. This indirect treatment demonstrated radiographic improvement with good functional outcome.\textsuperscript{10,13}

There is also literature supporting the use of C1 laminectomy for indirect decompression and reduction in pannus size. This strategy may be useful for patients unable to tolerate prolonged surgeries with significant blood loss and lengthy anesthesia exposure.\textsuperscript{9} There has been concern that C1 laminectomy without fusion may lead to further atlanto-axial instability. However, a reduction in neurologic symptoms can be feasibly obtained without progressive instability in most cases.\textsuperscript{14}
CONCLUSIONS

Retro odontoid pseudo tumors or odontoid pannus is a disease process characterized by formation of a posterior mass with possible cystic formation, which may lead to marked compression on vital neuronal structures at the cervico-cranial junction. Certain risk factors have been associated with an odontoid pannus including rheumatoid arthritis, Os odontoideum, or malunion of odontoid fracture. The basis of this disease process is believed to be due to atlanto-axial instability.

However, this may not be true for all cases, since it has been found that indirect techniques in the form of C1 laminectomy have helped reduce pannus size. In this patient’s case, we proposed cervical fusion and avoided a transoral approach due to his advanced age and inability to tolerate a more invasive procedure. After our two-year follow-up, the pannus and associated cyst had significant reduction with resolution of cord signal change within the medulla.

We therefore support the use of posterior fixation for treatment of this disease process, particularly in older patients. Further investigations of the pathophysiology of this disease process are warranted to help create a more unified treatment approach. Whichever surgical intervention is decided, early recognition and treatment of spinal cord compression can help improve neurologic outcomes.

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The authors declare no conflict of interest.

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REFERENCES


TABLES AND FIGURES

Figure 1

A. Pre-operative MRI sagittal T2 sequence, hyperintense signal (black arrow) within medulla representing encephalomalacia due to pannus compression.

B. Post-operative T2 sagittal MRI showing reduction in cyst size and resolution of hyperintense signal within medulla (black arrow).

C. Pre-operative T2 sagittal MRI showing spondylosis and central stenosis from C4-6 (white arrow).
D. Post-operative sagittal CT scan Bone window showing C1-6 posterior cervical fusion.

E. Pre-operative T2 sagittal with odontoid pannus (white arrow), and cystic component (black arrow).

F. Post-operative T2 sagittal MRI showing odontoid process with reduction in pannus size (white arrow), and collapse of cystic component (black arrow).
Are Emergency Medicine Residents Provided Adequate Training in Patient-Centered Communication?: A Resident Survey

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ABSTRACT


CONTEXT: Emergency Medicine residents frequently face challenging communication situations. Little is known regarding resident comfort level and amount of training received in managing these types of patient care scenarios. The purpose of this study was to measure the relationships between Emergency Medicine resident comfort levels, reported amount of patient-centered communication training received and correlation between amount of GME training and comfort levels when handling difficult situations in emergency departments. METHODS: In 2016, the authors used the Council of Emergency Medicine Residency Directors (CORD) listserv to disseminate an online survey to Emergency Medicine residents. Survey content came from the Patient Centered Communication subsection of The American Board of Emergency Medicine Milestones. This survey included five different patient scenarios. RESULTS: There were a total of 306 completed surveys. Residents rated their comfort level as most comfortable in scenarios regarding exhibiting empathy and least comfortable when providing bad news to patients or dealing with drug-seeking patients and difficult family members. Training was most prevalent in the areas of exhibiting empathy and giving bad news and lowest in managing drug-seeking patients and difficult patients. CONCLUSIONS: This survey revealed that Emergency Medicine residents do not consider themselves generally comfortable in multiple communication scenarios and that the amount of training received in these areas is often lacking during residency. A statistically significant positive correlation existed between comfort level and amount of graduate medical training in most areas. Results suggest that increasing the amount of communication training during residency may be of benefit in influencing how comfortably residents handle difficult patient scenarios. Keywords: patient-centered communication, resident training

INTRODUCTION

Current literature regarding patient-centered communication (PCC) skills training during residency is lacking any clear consensus on the best way to educate residents. Additionally, the literature available relies on a limited body of research investigating the difficult communication situations in which residents often find themselves. It has,
however, been demonstrated, that residents benefit when they receive specific PCC training in addition to technical training.\textsuperscript{1-4} Different PCC training modalities have been examined, including simulation labs, week-long courses, and standardized patient encounters.\textsuperscript{3,5} There is evidence that Emergency Medicine (EM) residents who have undergone communication skills training programs are more confident and consistently receive greater patient satisfaction scores and fewer patient complaints.\textsuperscript{3}

Emergency Medicine residents are required to reach milestones that show competence in a variety of areas, one of which is “Patient-Centered Communication.”\textsuperscript{6} (Appendix 1) In response, the authors created a survey to identify specific areas of PCC skills in which residents might feel stronger and weaker. The authors designed the survey to determine how much PCC training residents had previously received at time of survey. Before the study, the authors had hypothesized that most residents would respond that they had not received adequate PCC training in these areas and would not be entirely comfortable in these types of scenarios.

**METHODS**

An online survey of EM residents was disseminated using the Council of Emergency Medicine Residency Directors (CORD) listserv that includes 194 EM program directors.\textsuperscript{7} The program directors were asked to forward the survey to their respective residents to investigate the comfort level and amount of PCC training received in handling common challenging communication situations in their emergency department. All survey responses were anonymous. Survey links were sent on May 15\textsuperscript{th}, 2015 and the survey closed on June 15\textsuperscript{th}, 2015. Prior to data collection, the project received an exempt approval by the Lakeland Health Institutional Review Board.

Survey scenarios came directly from The American Board of Emergency Medicine’s (ABEM) established EM Resident Milestones under the subsection entitled “Patient Centered Communication.”\textsuperscript{6} (Appendix 1) The specific scenarios that were chosen included: a) *Giving patients bad news*, b) *Dealing with drug-seeking patients*, c) *Handling difficult family members/friends of a patient*, d) *Managing high-risk patients who refuse medical care*, and e) *Exhibiting empathy towards patients*. 
The first five questions of the survey described some of these PCC scenarios and asked respondents first how comfortable they were with their communication skills in a given scenario, and second, how much prior PCC training they had received to manage the scenario. A Likert-type scale of 1-5 was used to rate comfort level with "1" correlated with "Very Uncomfortable" and a "5" response being "Very Comfortable." Similarly, a 1-to-5 numerical Likert scale was used to rate the amount of PCC training received with qualifiers next to each number. For this item, a "1" correlated with "No Training" and "5" being "An Extensive Amount of Training."

Analyses

The survey results were analyzed using standard descriptive statistics, such as Mean with Standard Deviation and Frequency (Percentage) for each question. To examine for any significant correlations between respondents' comfort level ratings and their amount of PCC training for each scenario, a series of Pearson's Chi-Square tests procedures were run. A Coefficient Alpha P value of <.05 was considered statistically significant. All analyses were completed using SPSS version 22 software.

RESULTS

The authors received a total of 306 surveys. The respondent characteristics are shown in Table 1. It is important to note that less than 2% of data concerning these survey items were missing from sample respondents.

- 127/304 female (41.8%), 177/304 male (58.2%)
- 125/306 community-based (40.8%), 181/306 (59.2%) university-based
- small (<24 residents) 55/300 (18.4%), medium (25-36 residents) 135/300 (45.2%), large >37 residents 110/300 (36.4%)
- 191/304 (62.8%) junior residents, 113/304 (37.2%) senior residents
I. Comfort and Training Level Data in Communication Scenarios

When comparing comfort levels among residents during the five PCC scenarios, results showed that the mean comfort level in all areas were between 3.6 and 4.4 (Table 2). Respondents felt most comfortable showing empathy towards patients (Mean 4.40; SD 0.918), followed by giving bad news (Mean 4.04; SD 0.889), refusal of care (Mean 3.75; SD 0.961), dealing with drug-seeking patients (Mean 3.669; SD 0.997), and dealing with difficult patients (Mean 3.667; SD 0.958). There was a relative trend towards senior residents (i.e., PGY 3 and PGY4) feeling more comfortable in all PCC scenarios except in the category of exhibiting empathy (Table 3).

Comparing the amount of prior PCC training among residents in all communication scenarios, the mean amount of training in all areas fell between 2.50 and 2.95 (Table 2). Residents received the most training in giving bad news to patients and families (Mean 2.95; SD 0.835), followed by empathy (Mean 2.76; SD 0.899), refusal of care (Mean 2.61; SD 0.905), dealing with drug seeking patients (Mean 2.52; SD 0.843), and dealing with difficult family/friends of patients (Mean 2.50; SD 0.831).

II. Does comfort level correlate with amount of PCC training?

A series of Pearson product-moment correlation coefficient were generated to examine the relationship between residents’ comfort levels and their amount of PCC training for each scenario. Overall, there was positive correlation between comfort level and amount of PCC training for all situations except for empathy (Table 4). The four of five areas in which there was a positive correlation were each statistically significant with a P value of < 0.001. The strongest correlation was in the area involving refusal of care (r = +.378, n = 305, p < 0.001), followed by dealing with drug-seeking behavior (r = +.287, n = 306, p < 0.001), dealing with difficult family/friends (r = +.215, n = 306, p < 0.001), and giving bad news (r = +.193, n = 305, p < 0.001). The product coefficient when examining the relationship between comfort level of demonstrating empathy and the amount of training was not significant at r of +.018, n = X303, and P value of 0.767.
III. Learning Method Preference Data

Residents were asked what their preferred method of learning in residency was outside of physically working in their emergency department. (Table 5) The most preferred method was “listening to podcasts” (n = 116; 38%). This was followed by ‘reading on my own’ (n= 56; 18.3%), simulation labs (n = 55; 18%) and ‘small group discussions’ (n = 45; 14.8%). Overall, lectures, attending courses, and standardized patient encounters received significantly lower ratings.

DISCUSSION

Our study results revealed that most respondents did not consider themselves completely comfortable in multiple communication scenarios, and that many residents felt that their training in patient-centered communication had been lacking. Given the feedback that we have anecdotally received during recent years, we also concluded that there is likely no standard way for educating EM residents in PCC and some residents appear to be receiving more training.

On average, dealing with difficult family members and/or friends had the lowest rated resident comfort level of the five scenarios. Residents rated themselves as second least comfortable in handling situations involving drug seekers. Our findings are consistent with previous studies that have demonstrated resident discomfort in managing chronic pain patients and prescribing pain medications. Although the Accreditation Council for Graduate Medical Education (ACGME) requires training in pain management, it continues to be an area in which many sample residents felt they had been inadequately trained. Interestingly, this was the second lowest rated area in regards to training. The scenarios regarding refusal of care by high-risk patients and giving bad news fell in the middle of the five scenarios in both comfort level and training differences.

As a whole, residents trended towards being very comfortable with exhibiting empathy, which was the highest rated of all five scenarios. Although not statistically significant, this was the only area (exhibiting empathy) in which junior residents were more comfortable than senior residents were. Anecdotal evidence in other settings has supported the belief that EM residents begin residency feeling more empathetic towards
their patients than when they graduate.\textsuperscript{10-12} Ideally, most junior residents will develop these types of interpersonal skills during their progression through residency.

\textbf{Training Improvements}

EM Residency program faculty may want to consider ways to provide their residents with more training in how to handle these types of challenging situations and improve their communication practices toward patients. These results indicated that some EM residents may use podcasts, independent reading, and simulation labs as their preferred learning methods in these areas.

\textbf{Study Limitations}

Though content from the EBEM EM Resident Milestones were utilized in creating the survey questions in this study, the survey itself was not validated. In addition, the amount of training that respondents reported was subjective and it is difficult to know how many hours/what type of training the residents received in any of these areas of practice. It is certainly unclear whether respondents' actual competence was related to their reported comfort levels and/or attainment of ACGME communication milestones. Finally, our results may have been skewed from this self-selected convenient sample.

\textbf{CONCLUSIONS}

In summary, training in communication/difficult situations faced in the ED appears to be lacking in many EM residency programs, contributing to lower comfort levels for many EM residents. However, many of our sample respondents perceived themselves as being quite comfortable exhibiting empathy and giving bad news to patients. It is interesting that comfort in giving empathy in our sample was the only skill that appeared to diminish during the later years of residency. Given the importance of having strong communication skills as an EM physician, it should be made a priority by residency programs to establish curricula that help residents further develop these skills and achieve ACGME milestones prior to graduation.

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The authors declare no conflict of interest.

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### Appendix 1:
The American Board of Emergency Medicine Milestones on Patient Centered Communication

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<tr>
<th>Has not Achieved Level 1</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
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<tr>
<td>Establishes rapport with and demonstrate empathy toward patients and their families</td>
<td>Elicits patients’ reasons for seeking health care and expectations from the ED visit</td>
<td>Manages the expectations of those who receive care in the ED and uses communication methods that minimize the potential for stress, conflict, and misunderstanding</td>
<td>Uses flexible communication strategies and adjusts them based on the clinical situation to resolve specific ED challenges, such as drug seeking behavior, delivering bad news, unexpected outcomes, medical errors, and high risk refusal-of-care patients</td>
<td>Teaches communication and conflict management skills</td>
<td>Participates in review and counsel of colleagues with communication deficiencies</td>
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<tr>
<td>Listens effectively to patients and their families</td>
<td>Negotiates and manages simple patient/family-related conflicts</td>
<td>Effectively communicates with vulnerable populations, including both patients at risk and their families</td>
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Comments:
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<tr>
<td>Male</td>
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<tr>
<td>Small (&lt; 24 residents)</td>
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<tr>
<td>Medium (25-36 residents)</td>
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<td>Large (&gt;37 residents)</td>
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<tr>
<td>Missing</td>
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<td>1.9</td>
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<tr>
<td><strong>Year of Training</strong></td>
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<tr>
<td>Junior Resident (1\text{st} or 2\text{nd} year)</td>
<td>191</td>
<td>62.4</td>
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<tr>
<td>Senior Resident (3\text{rd} or 4\text{th} year)</td>
<td>113</td>
<td>36.9</td>
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<td>Missing</td>
<td>2</td>
<td>0.6</td>
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<tr>
<td>Scenario</td>
<td>Mean</td>
<td>SD</td>
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<tr>
<td>Exhibiting Empathy (N=303)</td>
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<td>Drug-Seeking (N=306)</td>
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<tr>
<td>Managing Difficult People (N=306)</td>
<td>3.67</td>
<td>0.96</td>
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Scale: 1-very uncomfortable, 2-somewhat uncomfortable, 3-neither comfortable, 4-somewhat comfortable, 5-very comfortable

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<th>Mean</th>
<th>SD</th>
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<tr>
<td>Exhibiting Empathy (N=285)</td>
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<td>Refusal of Care(N=289)</td>
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<tr>
<td>Drug Seeking (N=296)</td>
<td>2.53</td>
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<tr>
<td>Managing Difficult People (N=301)</td>
<td>2.50</td>
<td>0.83</td>
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Scale: 1-No training, 2-minimal training, 3-some training, 4-significant training, 5-extensive training
### Table 3: Junior vs. Senior Resident Comfort Levels

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<th>Comfort level by PGY year</th>
<th>Mean</th>
<th>SD</th>
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<tr>
<td><strong>Exhibiting Empathy (N=304)</strong></td>
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<td>0.9179</td>
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<td>PGY 1-2 (N=189)</td>
<td>4.4286</td>
<td>0.9348</td>
</tr>
<tr>
<td>PGY 3-4 (N=112)</td>
<td>4.3750</td>
<td>0.8917</td>
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<tr>
<td><strong>Giving Bad News (N=303)</strong></td>
<td>4.0462</td>
<td>0.8903</td>
</tr>
<tr>
<td>PGY 1-2 (N=190)</td>
<td>3.9368</td>
<td>0.9350</td>
</tr>
<tr>
<td>PGY 3-4 (N=113)</td>
<td>4.2301</td>
<td>0.7793</td>
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<td><strong>Refusal of Care (N=303)</strong></td>
<td>3.7525</td>
<td>0.9567</td>
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<td>PGY 1-2 (N=190)</td>
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<td>1.0116</td>
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<td>PGY 3-4 (N=113)</td>
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<td>0.8466</td>
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<td><strong>Drug Seeking (N=304)</strong></td>
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<td>PGY 1-2 (N=191)</td>
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<td>PGY 3-4 (N=113)</td>
<td>3.9027</td>
<td>0.9817</td>
</tr>
<tr>
<td><strong>Managing Difficult People (N=304)</strong></td>
<td>3.6645</td>
<td>0.9609</td>
</tr>
<tr>
<td>PGY 1-2 (N=191)</td>
<td>3.5707</td>
<td>0.9646</td>
</tr>
<tr>
<td>PGY 3-4 (N=113)</td>
<td>3.8230</td>
<td>0.9376</td>
</tr>
</tbody>
</table>
### Table 4:
**Correlations between comfort level and amount of PCC training received**

<table>
<thead>
<tr>
<th>Comfort level with amount of training</th>
<th>P value</th>
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</thead>
<tbody>
<tr>
<td>Exhibiting Empathy (N=303)</td>
<td>0.767</td>
</tr>
<tr>
<td>Giving Bad News (N=305)</td>
<td>0.001</td>
</tr>
<tr>
<td>Refusal of Care (N=305)</td>
<td>0.001</td>
</tr>
<tr>
<td>Drug Seeking (N=306)</td>
<td>0.001</td>
</tr>
<tr>
<td>Managing Difficult People (N=306)</td>
<td>0.001</td>
</tr>
</tbody>
</table>

### Table 5:
**Preferred method of learning in residency**

<table>
<thead>
<tr>
<th>Learning Method</th>
<th>N=305</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listening to Podcasts</td>
<td>116</td>
<td>38.0</td>
</tr>
<tr>
<td>Reading on my own</td>
<td>56</td>
<td>18.3</td>
</tr>
<tr>
<td>Simulation Labs</td>
<td>55</td>
<td>18.0</td>
</tr>
<tr>
<td>Small Group Discussions</td>
<td>45</td>
<td>14.8</td>
</tr>
<tr>
<td>Lectures</td>
<td>23</td>
<td>7.5</td>
</tr>
<tr>
<td>Attending Courses</td>
<td>8</td>
<td>2.6</td>
</tr>
<tr>
<td>Standardized Patient Encounters</td>
<td>2</td>
<td>0.6</td>
</tr>
</tbody>
</table>
Ripping the Myth: Patients’ Symptomatic Descriptions of Acute Thoracic Aortic Dissection

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ABSTRACT

NAGABHUSHAN M, WEBLEY J. Ripping the Myth: Patients’ Symptomatic Descriptions of Acute Thoracic Aortic Dissection. Spartan Med. Res. J. Vol. 3, No. 1, pp. 106-111, 2018. CONTEXT: The objective of this retrospective project was to assess the frequency with which patients presenting to an emergency department had used the descriptive terms “ripping” and “tearing” to describe their symptoms from later-confirmed acute thoracic aortic dissection. METHODS: The authors conducted a retrospective chart review from 58 patients who had presented to two suburban and urban emergency departments with suspected acute thoracic dissection between 1997 and 2015. They reviewed charts for patients’ pain descriptors in ambulance personnel records and initial notes and dictations from ED triage nurses, staff nurses, and physicians. These pieces of documentation would have been made before the diagnosis of acute thoracic aortic dissection could be confirmed. RESULTS: The authors identified a sample subset of 29 (50% of total charts pulled) patients later confirmed to have had an acute thoracic aorta dissection. They found that no sample patients used either the descriptors “ripping” or “tearing” when communicating their presenting symptoms. In this paper, the authors will provide several alternative terms patients have been shown to offer for this life-threatening condition. CONCLUSIONS: Although the terms “ripping” and “tearing” have historically been associated with acute thoracic aortic dissections, these project results indicate that clinicians may consider other descriptive symptomatic terms from patients when evaluating patients’ symptoms for this potential life-threatening condition. Keywords: thoracic aortic aneurism, patient symptoms, emergency medicine

INTRODUCTION

Acute dissection of the thoracic aorta is a life-threatening problem for patients who have sustained a tear in the innermost intima lining of the aorta.¹ The patient’s hydrodynamic pressure of blood flow then expands the tear proximally, distally, or in both directions into and through the other layers of the artery. As the rent (i.e., defect) in the aortic wall dissects its way along the aorta, this condition may compromise other
connecting arteries (e.g., carotids, subclavian, renal, spinal arteries) depending on the direction and length of the tear.¹

Additionally, a proximal tear into the root of the aorta may dissect into: a) the coronary arteries causing a myocardial infarction, b) damaged aortic valve causing sudden congestive heart failure, or c) break free into the pericardium causing abrupt catastrophic death from pericardial tamponade.¹ The large number of organs that may be involved during this disease process causes patients’ associated symptoms to vary widely, frequently confusing clinicians.²

In 2000, a group of experts in The International Registry of Acute Aortic Dissection (IRAD) found in a sample with 464 TAD patients that severe pain (95.5%) was their most common symptom.³ The pain was, in fact, more commonly described as “worst-ever” (90.6%), “abrupt onset” (84.8%), and “sharp” (64.4%).³ In this larger study, “ripping” or “tearing” researchers identified these terms in 50.6% of sample cases.³

Acute thoracic aortic dissection (TAD) has claimed the lives of numerous famous individuals including John Ritter, Lucille Ball, Jonathon Larson (writer of Rent), and King George II of England. The condition continues to afflict 5,000-10,000 people a year in the US.¹ TAD has a shocking mortality rate estimated at 40% initially and additionally increasing 1% per hour. Overall, the condition has a 90% mortality rate over the course of 12 months.²⁴⁵ Consequently, an early and accurate diagnosis of TAD is essential for its management and few emergency department (ED) presentations are as time-dependent.⁶⁷

Unfortunately, two studies have grossly estimated that only one in 10,000 emergency department patients actually has this condition.⁶⁷ This makes TAD a condition that every emergency physician will typically see only several times during their careers. Consequently, no physician will see TAD frequently enough to become expert regarding the condition or in making the diagnosis. In fact, TAD has been shown to be initially misdiagnosed in 15-43% of cases.⁶⁷ Authors have asserted that even the most experienced expert clinicians remain prone to making a difficult or delayed diagnosis or failing to ever diagnose the condition.⁸ In summary, TAD is an especially uncommon deadly disease with protean symptomatology.
Those ED physicians seeing patients with possible TAD symptoms need to consider the radiation exposure of CT scans, healthcare system costs, cost of incidental findings, and time spent in ED as factors which may preclude the work-up of many patients lacking a realistic possibility of having TAD. Still, clinicians should conduct an initial work-up for TAD when an ED patient with this prospective condition presents for treatment with these types of symptoms. Clinicians should first use the same initial tools: patient history and a physical examination. It is important that clinicians seek descriptors of the type and nature of the patient’s pain that will help lead them to determine the proper work-up for a timely diagnosis.

Historically, medical educators have indicated that patients with TAD typically describe their pain with the adjectives of “tearing” or “ripping.” Tintinalli and colleagues characterized aortic dissection symptoms as a ripping or tearing sensation accompanied by a sense of impending doom. In 2012, another group stated that TAD patients typically present with abrupt onset of tearing or stabbing chest pain. The authors’ clinical experiences, however, have challenged the classic belief that these descriptors would be used by many patients with acute TAD. In response, this retrospective pilot project was conducted to examine what proportion of patients with later confirmed TAD had actually used the classic words “ripping” or “tearing” to describe their pain when presenting to an ED.

METHODS

The authors initiated a systematic retrospective chart review of patients who had presented to the EDs of two Michigan hospitals. The first hospital was a suburban hospital with an annual census of 60,000 patients. The authors reviewed the charts from this facility from years 1997 through 2007. The second hospital was a community urban hospital with an annual census or approximately 27,500 patients. The authors reviewed this system’s charts after the implementation of their electronic health record (EHR) on January 2011 through June 2015.

Initially, the authors electronically searched medical charts by using specific search terms in the discharge diagnosis EHR field such as “aortic dissection,” “thoracic aortic dissection,” or “dissection.” The authors then systematically audited the initial group of
identified charts for documentary evidence of TAD. The inclusion criteria for patients to be included in the project sample included confirmation of a TAD by: a) radiographic or angiographic testing, b) cardiac catheterization, c) surgical confirmation, or d) postmortem examination.

Next, the authors inspected all charts with a confirmed TAD. They only examined those areas of the chart where the physician and patient could not have already known patients’ TAD diagnosis. These documentation areas included ambulance transfer notes, notes taken by nurses at initial ED triage, initial bedside ED nursing assessments and the initially treating ED physician notes or dictations. The authors then searched for any notations in these documentation sources in which the patient had described their pain as “ripping” or “tearing.”

RESULTS

The initial EHR search identified 58 potential patients with TAD discharge diagnoses that indicated they might be included in the chart audit sample. Of this number, the authors excluded 20 (34.5%) patients since they had experienced an aneurysm without rupture or dissection. One (1.7%) patient was excluded with an initial diagnosis of TAD but no thoracic dissection as later found on radiographic studies (i.e., an abdominal aortic dissection). Five (8.6%) more patients were excluded because they were direct hospital admits without ED records. The authors excluded one (1.7%) additional patient because their dissection had occurred after admission to the hospital floor. Finally, two (3.4%) more patients were excluded because they had transferred from other hospitals and their ED records were not readily available.

Ultimately, the medical records of 29 (50.0% of initially pulled) patients met inclusion criteria for evaluation. In summary, the authors’ review of these 29 patient charts failed to show a single documented use of the words “ripping” or “tearing” in patient’s description of their pain in any designated narrative or diagnostic documentation areas.

DISCUSSION

A patient’s initial history is a key element in making a diagnosis of TAD. How patients describe their presenting symptoms are key elements in how clinicians’ decide
whether to pursue TAD as a possible differential diagnosis. Historically and contemporaneously, physicians have been instructed that patients will most often use the words “ripping” and “tearing” to describe TAD pain.\textsuperscript{9,10} The results of this pilot project calls that diagnostic principle into question since we found no documented use of either of these symptomatic descriptors among the charts of sample patients examined.

Unlike the larger IRAD study,\textsuperscript{3} our smaller-scale chart audit project results demonstrate no use of the terms “ripping” and “tearing.” This may reflect the methodology we used since we only audited the documentation sections that clinicians had completed before a TAD diagnosis had been confirmed. One could easily imagine a situation in which clinicians who already knew patients’ TAD diagnoses may have asked them whether their pain felt like “ripping or tearing” to which the patient could have simply agreed.

**CONCLUSION**

It will remain imperative for emergency medicine and other physicians to make time-dependent diagnoses of TAD in a timely fashion since the mortality risks are so very high. Judging from these findings, practitioners should not exclusively listen for the trigger words “ripping” or “tearing” when potential TAD patients are describing their symptoms. Judging from the results of this and prior studies providers may be more clinically shrewd to conduct a more comprehensive evaluation of other subjective pain descriptors.

Medical educators have traditionally taught students that the terms “ripping” and “tearing” are the typical descriptors patients will offer when describing the pain of TAD. Our project findings support our initial clinical impression that patients would not routinely use these terms. It can be especially problematic when physicians rely on these specific descriptors, leading unwary physicians toward a delayed or even missed TAD diagnosis.

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The authors declare no conflict of interest.

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