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Measuring Student Confidence in the Clinical Training through Self-assessment

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Abstract

Background: Student self confidence in clinical skills is viewed as an important assessment tool in medical education that promotes competence. In this study, we sought to assess student confidence in five clinical competency domains over the period of the third-year clinical podiatric medical curriculum. Student self confidence in these domains may be used to identify potential curriculum changes aimed at augmenting student knowledge and skills. **Methods:** Third-year podiatric students from five consecutive cohorts (2012-2016) completed a self-assessment survey on their confidence/perceived skill in each of five domains (Professionalism, Medicine, Radiology, Surgery and Biomechanics). The survey was completed twice, at the initial stages of the third-year after 12 weeks of clinical rotations (PRE) and it was retaken at the conclusion of the third year (POST), approximately twenty-four weeks later. Pooled data across cohorts were used to assess potential differences in self-confidence amongst domains, as well as, changes in skill confidence (PRE-*vs.* POST) for each of the domains over the third-year clinical curriculum. **Results:** The results demonstrated a statistically significant increase in student self-confidence in all five domains from the PRE-to POST assessment period, with more than 50% of the students assessing themselves at higher or equal to 4 (on a 5 point Likert Scale) on each of the domains at the conclusion of the third year. The students demonstrated significantly greater confidence in the Professionalism and Medicine domains at both points of assessment. The greatest gains in self-confidence over the third-year clinical curriculum were observed, in order, in the Surgery, Radiology and Biomechanics domains. Student confidence in Biomechanics lagged significantly behind the other domains at the end of the year with. **Conclusions:** Published studies have shown that the amount of medical student exposure to a clinical skill is directly related to student confidence level. Our findings show that even though confidence levels significantly increased in all domains, student self-assessment methodology can be used to identify strengths and weaknesses in student perception of their knowledge or skill, which may lead to specific curriculum modifications/enhancements.

Introduction

Student self-assessment is viewed as an important tool in medical education as a means to improve student performance, promote critical self-awareness and help build self-regulation skills [1,2] Cultivating medical students' clinical confidence is also known to be an essential element in the professional development of the student in various health profession programs [3]. More and more accreditation agencies are expecting academic programs to include student self-assessment as a formative methodology to evaluate student performance and confidence in both knowledge and mastery of clinical skills. Indeed, the skill to assess one's own abilities is necessary to continuously improve competencies in the ever-evolving health professions.

Little documented information on student self-assessment and confidence level exists in podiatric medical education. Therefore, the purpose of this study is to use self-assessment as a tool to measure and compare third-year podiatric medical student confidence levels and assess change after a full year of clinical training in five broad clinical competency domains. This may provide additional information when evaluating the curriculum for improvement purposes focusing on increasing students' confidence level before and during clinical exposure.

Method

Third-year podiatric medical students (N=237) from five consecutive classes (2012-2016) completed a self-assessment of their perceived skill competence in each of five clinical domains: Professionalism, Medicine, Radiology, Surgery and Biomechanics using a 5-point Likert scale (1-5) survey. The definition of each domain was provided in the form of specific clinical domain objectives (Table 1).

The self-assessment was completed after the first twelve weeks of third-year clinical rotations (PRE) and a second time at the end of the third-year (POST) approximately 24 weeks later. Pooled class data for each of the PRE and POST assessment domains was evaluated.

Student clinical experiences for the third year were essentially identical as the clinical curriculum is a prescribed series of 2-4 week clinical rotations. The majority of the rotations were podiatric focused that evaluated clinical objectives for all domains.

The third year also includes rotations in internal medicine, vascular surgery and a simulated emergency medicine experience. The service specific clinical objectives for these rotations were not included in the study. The Shapiro-Wilk Test for normality was used to determine the distribution

characteristics of the student confidence data for each of the domains.

Professionalism: 1. Communicates effectively with attending, team members and other healthcare professionals. 2. Communicates appropriately and professionally to patients and family members. 3. Displays a sense of responsibility, dignity and respect to patients, families, staff and peers. 4. Respects and adapts to cultural differences
Medicine: 1. Student is aware of patient's age, chief complaint with the history of present illness relevant to the chief complaint and past medical history. 2. Student obtains and grades lower extremity pulses and capillary fill time. 3. Student uses proper technique to fill syringe with local anesthetic, prepares the injection site and administers with minimal discomfort to the patient. 4. Student debrides all forms of hyperkeratotic lesions using appropriate technique without causing unnecessary pain or haemorrhage.
Radiology: 1. Student orders and interprets foot radiographs specific to the area of the suspected pathology as it relates to the history and physical. 2. Student orders and interprets ankle radiographs specific to the area of the suspected pathology as it relates to the history and physical. 3. Student describes indications for special imaging study, including the basic science behind its utilization. 4. Student shields patient in an appropriate manner to minimize x-ray exposure.
Surgery: 1. Student demonstrates proper sterile field set-up, proper gloving technique and appropriate handling of surgical instruments. 2. Student selects proper instrumentation, appropriate preparation of the procedure field and removal of sutures. 3. Student selects appropriate supplies, proper wound preparation and application of a wound dressing. 4. Students know the steps, instrumentation and indications required to perform a surgical nail procedure.
Biomechanics: 1. Student is able to perform a non-weight bearing biomechanical examination and interpret the data collected. 2. Student applies foot/ankle taping procedure using proper technique while maintaining the foot/ankle in ideal biomechanical position. 3. Student explains indications for and applies below knee splint or cast in appropriate manner. 4. Student is able to cast for an orthotic based on diagnosis and biomechanical indications.

Table 1: Examples of specific clinical objectives used for domain definition.

The Likert scale scores for all five domains (at the PRE and POST level) were not normally distributed, thus non-parametric statistics were used for the purpose of further statistical analysis. The Wilcoxon signed-ranked test was used to assess the effect of the third- year clinical curriculum on the student confidence levels for each domain. The Friedman test was used to test for domain differences at the PRE and at the POST stage of the third-year curriculum (at $\alpha \leq 0.05$ level of significance). Post hoc multiple comparisons amongst domains were done at the PRE-and POST level (separately) using the Wilcoxon signed-rank test at $\alpha \leq 0.005$ (Bonferroni adjustment 0.05/10) to reduce the likelihood of the Type I error.

Results

There was a statistically significant change in student confidence in all five competency domains from PRE to POST during the third-year curriculum (Figure 1). Student confidence increased in all domains over the course of the clinical training curriculum of the third year, predominantly in Surgery, Radiology and Biomechanics (44.1%, 39.2% and 27.7% change, respectively) and to a lesser extent, in Medicine and Professionalism (19.3% and 13.0% change, respectively).

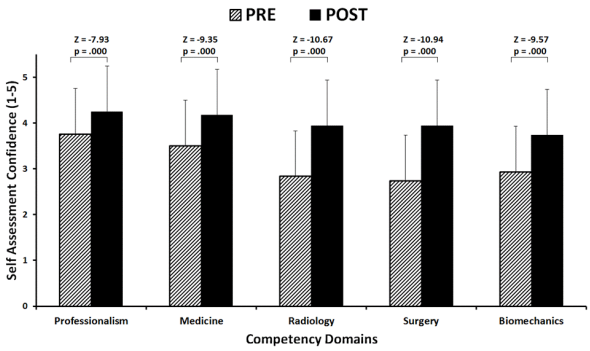

Figure 1: Student self-assessment confidence in all five competency domains.

The Friedman test showed statistically significant differences in the student confidence depending on which competency domain was assessed at the PRE (Figure 2A) and at the POST (Figure 2B) level of the third-year curriculum, $\chi^2(4)=329.2$, p=0.000 and $\chi^2(4)=138.5$, p=0.000, respectively. Post hoc analysis with Wilcoxon signed-rank tests was conducted ($\alpha \leq 0.005$, Bonferroni correction applied) at the PRE-and POST levels.

The multiple comparisons revealed that, at the PRE-level (Figure 2A), there were significant differences between all competency domains other than Radiology to Surgery (z=-1.412, p=0.158) and Radiology to Biomechanics (z=-1.222, p=0.222). At the onset of the third-year curriculum, the students showed greater confidence in Professionalism and Medicine (median 4.0) than Radiology, Surgery and Biomechanics (median 3.0). However, at the end of the 3rd year clinical curriculum (POST level, Figure 2B), while the student's confidence in all domains improved, the post hoc comparisons showed no difference between Professionalism and Medicine (z=-1.940, p=0.052) and between Radiology and Surgery (z=-0.082, p=0.935). The median confidence level for all competency domains was 4.0 at the POST level,

with the highest student confidence in Professionalism and Medicine and the lowest in Biomechanics.

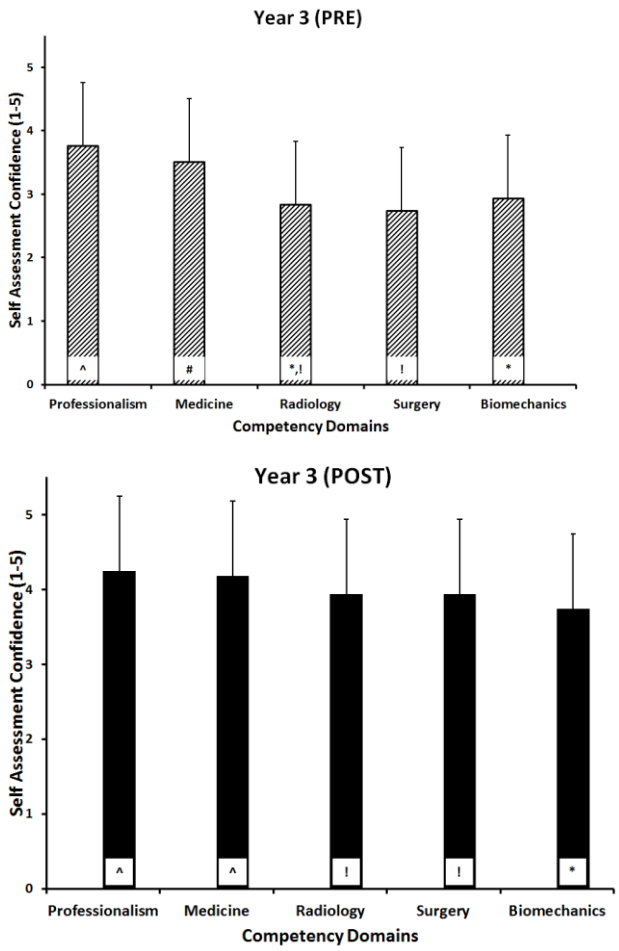

Figure 2: Student self-confidence in all five competency domains: (A) at the beginning of year 3 (PRE) and (B) at the end of year 3 (POST).

Discussion

The findings of this study highlight the confidence students have in meeting the competency requirements of the clinical curriculum in all self-assessed domains. The results demonstrate an increase in the confidence of students in all five domains from PRE to POST after a year of clinical training. The highest self-assessment competency domain was Professionalism. This comes as no surprise, as Des Moines University adopted a student driven honor code during the 1999-2000 academic year, now the Professional Integrity Code (PIC). Students also receive extensive training on the PIC during the first-year orientation. Professionalism competencies are also integrated throughout the curriculum. It also comes as no surprise that the many clinical experiences students receive in the third-year would be codified as

Medicine competencies, considering this domain includes many of the most common foot and ankle conditions. Overall, student confidence levels in Biomechanics consistently lagged behind the other domains. Biomechanical clinical skills are the cornerstone to managing many musculoskeletal disorders of the foot. Students appear to be less confident in this essential component of the curriculum and clinical practice. This finding may be related to the complexity of the content that requires the student to demonstrate the knowledge and skills of a coordinated system of muscle and joint function. Even though third-year students are required to demonstrate competency in each of the five domains evaluated, there exists a perceived lack of confidence in Biomechanics relative to the other assessed domains.

Published studies have shown the amount of medical student exposure to a clinical skill is directly related to student confidence level [3-12]. In evaluating the number of student reported clinical exposures to the various Biomechanics competencies for the cohorts included in this study, there does not appear to be an issue with the volume of clinical exposures available to students compared to Radiology or Surgery competencies.

Another interesting finding was student performance on the Orthopedics, Biomechanics and Sports Medicine section of Part II of the American Podiatric Medical Licensing Examination (APMLE) showed students from Des Moines University consistently scored above the national average for individual cohorts included in this study, with an overall five-year first-time pass rate of 84.22% compared to the national rate of 80.7%, albeit the APMLE Part II is a knowledge based examination. Lastly, specific to the Biomechanics domain were comments identifying some level of inconsistency between faculty members' presentation of biomechanical concepts in relation to reinforcement of basic principles, clinical application and nomenclature.

Student confidence level can be increased through a variety of learning processes, but mainly by increasing the volume of exposure to a specific clinical skill. Goolsby et al. [7] examined the effects of fourth-year medical students' procedural confidence after a change in curriculum during an emergency medicine clerkship. They found that adding specific simulation training was helpful in improving the students' confidence level in performing procedural skills. Per Bruhild et al. [12] introducing simulation exercises in the management of a semiconscious overdose victim scenario using a high-fidelity mannequin was a key learning resource to increase second-year medical student confidence prior to beginning clerkship training based on a pre- and post-exercise assessment.

Another study by Chunharas et al. [10] showed that when medical students practiced subcutaneous and intramuscular injection skills on each other as opposed to using a model, their confidence level and performance of a vaccination injection on paediatric patients increased considerably compared to a group of medical students who only practiced on models. Shinnick et al. [6] showed that the addition of a student-run training day in women's primary care skills, a subject where most medical students experience a sense of apprehension, was beneficial in increasing perceived

confidence level. In a study by Jagadeesan et al. [11] evaluating the relationship between didactic clerkship experience in radiation oncology and student confidence levels, medical students with prior didactic experiences in radiation oncology clerkships reported higher confidence levels in respect to preparedness for an oncology radiation residency compared to students not having similar experiences.

The results of our study offer insight into the confidence levels of students in the five domains evaluated through self-assessment. Having this information encourages faculty to consider additional supplementation of the curriculum as deemed appropriate.

Limitations of the study include enrolling only five classes, involving only one institution, combining multiple detailed clinical skills into a single domain and having no formal reliability or validity done on the clinical self-assessment survey instrument.

Conclusion

Evaluating student confidence in a variety of domains through self-assessment may lead to identifying opportunities in both the pre-clinical and clinical phases of the academic program with the objective of enhancing student knowledge and clinical performance in targeted domains. This study demonstrates the value of student self-assessment and its relationship to student confidence and identifies the pedagogical strategies available to enhance clinical skill performance.

Furthermore, the findings of the cited medical education studies identify the value of consistency in presenting concepts, reinforcement of competencies during clinical application, a robust clinical skills assessment and feedback process and consideration for supplementation of the curriculum through experiential learning including supervised patient care, simulation and standardized patient experiences.

Using information gained from multiple sources including student self-assessment, combined with the availability of new student learning environments and technologies may lead to greater student confidence, which translates into higher order learning and competency.

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