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Does medical student knowledge of anticoagulation differ by future intended practice?

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Abstract

Background—The scope of medical student knowledge may differ by the student’s future intended specialty.

Aim—To determine whether medical student knowledge of and confidence with anticoagulation differed by perceived likelihood of managing anticoagulation in future practice.

Methods—One hundred twenty-third and fourth year medical students (41% response rate) participated in a cross-sectional web-based survey. We assessed whether perceived likelihood of managing anticoagulation in future intended practice was associated with anticoagulation knowledge and confidence with managing anticoagulation.

Measurements and Main Results—Out of 24 questions assessing anticoagulation knowledge, the mean percentage correct was 58% (SD 29%). Anticoagulation knowledge did not differ by perceived likelihood of managing anticoagulation as part of their future practice. However, students predicting higher likelihood of managing anticoagulation in their future practice were significantly more confident about their ability to manage anticoagulation ($p=0.005$).

Conclusion—Using anticoagulation as a model, we did not find evidence that medical student knowledge differed by perceived scope of future practice. Future study will need to confirm whether range and depth of medical knowledge differs by medical students intended future practice and specialties.

Introduction

It is uncertain how plans for future specialization may affect medical student learning experience. It is possible that students focus their attention on topics that they perceive to be more important to their future intended specialties, which was evident in a study where students interested in oncology tested significantly higher on cancer related items (Peters et al., 1986). While undergraduate medical education is rather uniform during the pre-clinical years, the

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Notes on Contributors

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curriculum during the clinical years can vary widely for students at the same institution due to individual selection of electives and acting internships. Little is known about whether students intending differing future specialties complete medical school with varied levels of knowledge of certain topics. We sought to determine whether knowledge and confidence with medical management differed by students' future intended scope of practice. We chose the topic of anticoagulation to test our hypothesis because it is a widely used therapeutic, and knowledge and confidence with anticoagulation has been shown to vary widely among graduating medical students (Budnitz et al., 2007, Coombes et al., 2008, Hauer et al., 2008, Kakkar and Kaur, 2004).

Materials and Methods

This study was approved by the Institutional Review Board at the Penn State College of Medicine. In September 2008 we emailed all 156 third and 142 fourth year medical students at The Penn State College of Medicine. The email invited the students to participate in an anonymous web-based survey to assess knowledge and attitudes regarding a commonly encountered medical topic. Consent was implied with completion of the survey, which was accessed through an electronic link to the web-based survey. The students were emailed 3 reminders to participate in the study at one week intervals. To provide incentive for participation, four respondents were randomly chosen to receive \$25 cash prizes.

The 38-item web-based survey was designed for the purpose of this study. The survey was pilot-tested with a small sample of 2nd year medical students to ensure clarity of the survey questions. The main independent variable was perceived likelihood of managing anticoagulation in their future scope of intended practice. Students were asked to rate how often they expected to perform each of the following 5 specific anticoagulation tasks in their intended future practice on a 5-point Likert scale (often, sometimes, occasionally, rarely, or never): 1) initiating DVT prophylaxis, 2) managing chronic anticoagulation for a patient with atrial fibrillation, 3) managing chronic anticoagulation for a patient with mechanical heart valves, 4) managing perioperative anticoagulation, and 5) reversing warfarin therapy in the context of an acute bleed. Based on the responses to the 5-point Likert scale, each item was scored a corresponding value of 1–5. A mean score indicating perceived likelihood of managing anticoagulation in future intended practice was computed for each individual.

The dependent variables were anticoagulation knowledge and confidence with managing anticoagulation. Knowledge was assessed with 24 questions testing basic pharmacological concepts of warfarin, unfractionated heparin, and low molecular weight heparin; specifically mechanisms of action, side effects, indications, routes of administration, food and drug interactions, dosages, laboratory monitoring, and target international normalized ratio (INR) levels. Knowledge scores are reported as percentage of correct responses.

Confidence with managing anticoagulation was assessed by asking students to rate their confidence to perform 5 specific anticoagulation related tasks, using the same 5 anticoagulation tasks as described above for the scope of intended future practices questions. For example, students responded on a 5-point Likert scale (strongly agree, agree, neutral, disagree, or strongly disagree) with the following statement: I feel confident initiating deep venous thrombosis (DVT) prophylaxis during a patient's hospitalization. A mean score indicating confidence with managing anticoagulation was computed for each individual.

We assessed the correlations between perceived likelihood of managing anticoagulation in intended future practice with knowledge scores and confidence scores using Pearson Correlations. All statistical analyses were performed using SAS software, Version 9.0 of the SAS System for Windows (SAS Institute Inc., Cary, NC).

Results

One-hundred twenty three students completed surveys (41% response rate). Table 1 shows the characteristics of the sample. The mean knowledge score was 59% correct (SD 11%; median 58%; interquartile range 50% – 67%). Students scored well with questions pertaining to antidotes of anticoagulation, route of administration and mechanism of action of warfarin, laboratory monitoring of warfarin and heparin, and identifying agents contraindicated in pregnancy. Students scored poorly with questions pertaining to food and drug interactions, genes that affect warfarin sensitivity, heparin dosing and side effect profiles of warfarin and heparin.

The mean score for perceived likelihood of managing anticoagulation in future intended practice was 3.2 (median 3.2, interquartile range 2.2–4.2). These scores correspond to the 5-point Likert scale used to assess perceived likelihood of managing specific anticoagulation scenarios (1=never, 2=rarely, 3=occasionally, 4=sometimes, 5=often). There was no association between perceived likelihood of managing anticoagulation in future intended practice and knowledge scores ($r=0.07$, $p=0.48$). There was no significant difference in knowledge scores by gender ($p=0.72$). Fourth year medical students had significantly higher knowledge scores than third year medical students (61% vs. 54%, $p=0.0009$).

The mean confidence score with managing the 5 anticoagulation scenarios was 2.7 (median 2.8, interquartile range 2.0–3.6). These scores correspond to the 5-point Likert scale used to assess confidence in managing specific anticoagulation scenarios (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree). Higher perceived likelihood of managing anticoagulation in their future intended practice was associated with higher confidence in managing anticoagulation ($r=0.27$, $p=0.005$). Additionally, knowledge scores were significantly correlated with confidence in managing anticoagulation ($r=0.40$, $p<0.0001$). There was no significant difference in confidence scores by gender ($p=0.24$), however fourth year medical students were significantly more confident in their anticoagulation management skills than third year medical students (3.2 vs. 2.1, $p<0.0001$).

Discussion

We hypothesized that medical students focus their learning toward their future intended specialization. We tested this hypothesis with the topic of anticoagulation management, expecting that students who believed they would be managing anticoagulation in their intended specialties would be more knowledgeable and confident with anticoagulation management. While we did find that confidence was higher among those with higher perceived likelihood of managing anticoagulation in their future practice, there was no difference in knowledge.

Future study will be needed to confirm whether range and depth of knowledge are really unaffected by future intended practice and specialization. If that is the case, it may be that students do have an interest in broad learning irrespective of their future intended specialty. It may also be due to students' residency choice being in flux throughout their clinical years, and thus they are not yet ready to focus their learning interests into a specific facet of medicine and choose to remain broad learners. Certainly many factors other than intended career choice shape the learning patterns of undergraduate medical students, such as desire to perform well on evaluations. It should also be considered that we may have failed to detect knowledge differences by future intended practice due to differences in knowledge that were not measured by our instrument, differences in level of experience, or other unmeasured factors that could relate to ability to apply knowledge to clinical practice. We suspect that these unmeasured factors may also explain why confidence in managing anticoagulation was higher in students

perceiving higher likelihood of managing anticoagulation in the future, yet no differences in knowledge was observed.

Our study has important limitations to consider. The study was performed at a single institution, which makes it difficult to generalize the results to all third and fourth year medical students throughout the country; performing similar studies at other institutions may be informative. The response rate was not optimal, potentially subjecting our results to response bias. Misclassification may have occurred since the assignment of individuals to the higher versus lower perceived likelihood of managing anticoagulation was done based on responses regarding 5 specific anticoagulation tasks that do not encompass the full spectrum of all anticoagulation related activities. While we were specifically interested in the topic of anticoagulation, studies of other medical topics (e.g. antibiotic management, laboratory interpretation) may have yielded different results.

The intent of undergraduate medical education is to provide grounding in all of the core clinical fields. If students become selective about what they learn because of their intended field of practice, it was not demonstrated in our study. Further understanding of what and how medical students learn as well as what contributes to their level of confidence with medical management upon medical school graduation may better inform how we teach students in their clinical years.

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Table 1

Characteristics of the study sample, N=123.

	Full Sample
Characteristics	N (%)
Male	55(45)
Age 20–24	28(22)
Age 25–29	84(68)
Age 30–34	10(8)
Age 35–39	1(1)
Third Year	51(41)
Fourth Year	72(59)
Perceived likelihood of managing anticoagulation in future intended practice—mean (SD)	3.2 (1.2)
Knowledge of anticoagulation management—mean (SD)	58% (11%)
Confidence in managing anticoagulation—mean (SD)	2.7 (0.9)

Table 2

Pearson correlations of anticoagulation knowledge scores and confidence with managing anticoagulation with perceived likelihood of managing anticoagulation in future intended practice.

Pearson Correlation Coefficient (p-value)	Anticoagulation knowledge scores	Confidence with managing anticoagulation scores
Perceived likelihood of managing anticoagulation in future intended practice	0.07 (0.48)	0.27 (0.005)