Analysis of medical dosimetry graduates' self-perceived level of preparedness upon graduation and comfortability time frame after entering the workforce

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Abstract

The purpose of this study was to analyze factors that affected a medical dosimetry graduate's degree of self-perceived preparedness upon graduation and time required to feel comfortably trained after entering the workforce. The influence on self-perceived preparedness upon graduation and self-perceived comfort after entering the workforce was evaluated by the following factors: prior clinical experience as a registered radiation therapist (RTT), satisfaction with clinical internship education, and job placement following graduation. Retrospective survey data was collected from cohort graduates of the University of Wisconsin-La Crosse (UWL) medical dosimetry master's degree program. Comparative analysis was used to evaluate how the factors affected self-perceived preparedness and time required to become comfortably trained after entering the workforce. Findings indicated that RTTs with clinical experience have higher levels of self-perceived preparedness upon graduation but take longer to feel comfortably trained after entering the workforce in a medical dosimetrist role. A positive correlation existed between clinical satisfaction and self-perceived preparedness upon graduation. Additionally, factors associated with relocating after graduation had a negative impact on time required to feel comfortably trained after entering the work force.

Key words: Medical dosimetry graduates, perceptions, preparedness, comfortably trained

Introduction

The premise of this report was that the education a graduate received from an accredited program affected confidence as a new medical dosimetrist. Currently, there is a lack of published data regarding medical dosimetry graduates' self-perceived levels of preparedness upon graduation and time required to become comfortably trained after entering the workforce. Baker et al[1] recommended investigating the relationship of previous work experience as a radiation therapist and the effect on success of a medical dosimetry graduate. Analysis of a survey conducted by Mills[2] indicated that sufficient training in both the academic and clinical

setting is crucial for medical dosimetrists, but does not explore the factors that influence this training. In addition, Lenards[3] provided evidence supporting the need for student confidence at the completion of a medical dosimetry program.

Medical dosimetrists come from a wide variety of educational and professional backgrounds. Historically, medical dosimetrists were classified as physics personnel who were mainly responsible for performing dose calculations and creating dose distribution maps.[4] Candidates were primarily radiation therapists with a strong mathematical background and interest in treatment planning procedures. The field of radiation oncology has experienced many technological advances and, consequently, designing treatment plans has become increasingly complex. As a result, the Medical Dosimetrist Certification Board (MDCB) decided that beginning in 2017, all candidates must graduate from a Joint Review Committee on Education in Radiologic Technology (JRCERT) accredited program and hold a bachelor's degree to be eligible for certification.[5]

The University of Wisconsin - La Crosse (UWL) offers a master's degree in medical dosimetry and was the fourth program in the nation to receive JRCERT accreditation. Admissions into the program considers candidates from two tracks: Track A for bachelor's degree recipients with radiation therapy certification (RTT) and Track B for bachelor's degree recipients without radiation therapy certification. While the academic course load is uniform, students are separated into individual internship sites and thereby have a unique clinical experience. Collecting retrospective survey data of the UWL graduates was advantageous because the population consisted of RTT and non-RTT students. The purpose of this study was to assess how different factors of a graduate's education impacted the level of self-perceived preparedness upon graduation and time required to feel comfortably trained after entering the workforce.

Methods and Materials

Retrospective survey data was used from the UWL medical dosimetry master's degree graduates between 2012 and 2015. As years progressed, there was growth in the program yielding varying and increasing cohort sizes from which to sample. The surveys were administered at different intervals among the various cohorts; some cohorts receiving more than one survey. Due to the deviation in survey administration, the sample sizes contain a level of variability. When all of the applicable survey questions were taken into consideration, 43

responses were collected out of the 57 graduates who received the survey, therefore having a response rate of 75.44%. The survey question regarding the length of time required for graduates to feel comfortable or trained in their medical dosimetry position received this response rate of 75.44% (43/57). Questions regarding self-perceived graduate preparedness, clinical satisfaction, and current employment status did not appear on all surveys; therefore, only 45 graduates received these questions. There was a response rate of 75.56% (34/45) when asked about self-perceived graduate preparedness, 77.78% (35/45) when asked about clinical satisfaction, and 80.0% (36/45) when asked about current employment status in medical dosimetry. When the surveys were administered there was one student who was not currently working in the medical dosimetry field, therefore giving a slight variation in the response rates out of 45 graduates previously stated because this graduate did not answer all questions.

Though each survey covered a variety of topics, this study used comparative analysis to focus on how particular factors affected a graduate's response when questioned about their self-perceived preparedness upon graduation and the time required to feel comfortably trained after entering the workforce. Using a scale from "poorly" to "very well" graduates were asked to rate their level of self-perceived preparedness upon graduation. Next, graduates were asked if they felt comfortable or trained within "1 month", "3 months", "6 months", "greater than 6 months", or if they did not feel comfortable in the workforce at the time the survey was administered. The responses to these two survey questions are the controlled basis for comparisons and evaluations made in this research. The influence on self-perceived preparedness upon graduation and comfort after entering the workforce was evaluated by the following factors: prior clinical experience as a registered radiation therapist (RTT), satisfaction with clinical internship education, and job placement following graduation.

The first goal of this research study was to determine if clinical experience as a RTT had a statistically significant impact on self-perceived preparedness upon graduation and time required to feel comfortably trained after entering the workforce. Prior clinical RTT experience, for the purpose of this study, was defined as an individual having held a position as an employed radiation therapist for any given time. Those with a valid RTT degree, but no clinical application of the degree, were not included in the prior clinical RTT experience subset. Of the sampled individuals (n=16), 9 graduates had prior clinical RTT experience, 3 graduates had a valid RTT degree but no clinical application of the degree, and 4 graduates had no RTT degree. This

sample served as the basis for evaluating the effect of prior RTT experience on self-perceived preparedness upon graduation or time required to feel comfortably trained after entering the workforce. A comparison between self-perceived preparedness and the time required to feel comfortably trained after entering the medical dosimetry workforce from all graduating classes was also conducted to gain more insight with a larger population.

The second goal of this research study was to assess whether satisfaction of a medical dosimetry graduate's clinical experience impacted self-perceived preparedness upon graduation or the time required to feel comfortably trained after entering the workforce (n=35). Given the choices of "satisfied", "somewhat satisfied" and "not satisfied", graduates were asked to provide a ranking of their overall clinical internship experience. To further assess medical dosimetry graduates' clinical experiences, graduates were asked to rate their level of confidence in specific treatment planning procedures that are set as program competencies. Responses to this question could identify opportunities for improvement of medical dosimetry clinical instruction and in turn, a higher level of self-perceived preparedness. The set of questions was utilized to determine if overall satisfaction in one's learning environment transfers to self-efficacy.

The third goal of this research study was to discern post-graduation factors that can affect time required to feel comfortably trained after entering the workforce. Whether new graduates received a job at their internship site was recorded to determine if graduates were affected by the adjustment period associated with relocating. The effect of learning a different treatment planning system at the start of the graduates' first medical dosimetry job was examined as well.

Results

Research goal 1

Analysis of retrospective data from the UWL surveys showed that those with prior clinical RTT experience felt more prepared for their medical dosimetry jobs (Figure 1). Of those who had clinical application of their RTT degree, 66.7% (6/9) responded that they felt "very well" or "well" prepared upon graduation. Of the non-RTT graduates surveyed, 42.8% (3/7) responded that they felt "very well" or "well" prepared upon graduation. The surveys also indicated that a larger number of graduates with a clinical application of their RTT degree required a longer amount of time to feel comfortably trained after entering the workforce than those without RTT degrees and those without a clinical application of their RTT degree (Figure 2). Of those who had clinical application of their RTT degree, 33.33% (3/9) felt comfortable or

trained in the new position after 1 month, 11.11% (1/9) felt comfortable after 3 months, and 55.56% (5/9) required more than 6 months to feel comfortable. Of the non-RTT graduates surveyed, 42.8% (3/7) felt comfortable or trained in the new position after 1 month, 28.57% (2/7) felt comfortable after 3 months, and 28.57% (2/7) of the population required more than 6 months to feel comfortable or did not feel properly trained.

Response rates from each graduating class' survey of self-perceived preparedness upon graduation and the time required to feel comfortably trained after entering the medical dosimetry workforce were also compared against each other to gain more insight with a larger population. Considering the length of time required for graduates to feel comfortably trained, 37.21% (16/43) felt comfortable or trained in the new position after 1 month and 53.5% (23/43) felt comfortable or trained within 6 months of beginning the position. Therefore, only 9.3% (4/43) of the population required more than 6 months to feel comfortable or did not feel properly trained when the survey was conducted. When questioned about self-perceived preparedness upon graduation, 50% (17/34) of the individuals surveyed felt very well prepared for a job after graduation. The number of responses per answer selection choice (i.e. "very well" or "adequately prepared") decreased in a linear fashion, terminating with no responses of "poorly prepared".

Research goal 2

In respect to the second goal of the research study, 82.85% (29/35) of medical dosimetry graduates reported feeling satisfied with their clinical internship experience while 17.14% (6/35) felt somewhat satisfied. There were no graduates that reported feeling unsatisfied with their clinical internship. The average level of confidence for the competency procedures performed during clinical internship was an 82.1% confidence rate. The procedure with the highest level of confidence, 95.19%, was prostate Intensity Modulated Radiation Therapy (IMRT) planning.

Research goal 3

In respect to the third goal of this research study, 43.75% (7/16) of the graduates were employed by their clinical internship site upon graduation. When the survey was collected, 93.75% (15/16) graduates were operating the same treatment planning system used during the clinical internship. Regarding current employment status, 91.67% (33/36) of respondents were working full time as medical dosimetrists at the time of the survey. Within the remaining responses, there was 1 individual in each of the residual options working part time, per diem, or not in the field of medical dosimetry.

Discussion

Research goal 1

The first aspect of the first research goal was to examine whether clinical experience as a radiation therapist affected medical dosimetry school graduates' self-perceived level of preparedness upon graduation. Analysis of retrospective UWL survey data showed that those with prior RTT clinical experience had a higher level of self-perceived preparedness upon graduation than those without clinical RTT experience (Figure 1). Mills[2] reported that the majority of medical dosimetrists thought that entrance to a medical dosimetry program should require a radiation therapy certification as well as a bachelor's degree. However, Baker et al[1] reported no statistical significance between prior clinical RTT experience and successful completion of a medical dosimetry program. In a study by Lenards,[6] 100% (9/9) of clinical preceptors saw no difference among students, regardless of clinical RTT experience, after approximately 6 - 9 months. Although the preceptors did not see a difference in the graduates upon graduation, the self-perceived preparedness felt by the graduates fluctuated.

The second aspect of the first research goal was to examine whether clinical experience as a radiation therapist affected the amount of time required for graduates to feel comfortably trained after entering the workforce. Retrospective UWL survey data indicated that a larger number of graduates with clinical application of their RTT degree required a longer amount of time to feel comfortably trained than those without RTT degrees and those without a clinical application of their RTT degree (Figure 2). In a study regarding the experiences of newly graduated medical residents, a majority of residents reported a consistent feeling of confidence in applying their knowledge at the end of six months.[7] A study considering "practice readiness" of newly graduated Canadian nurses found that preparedness was generally felt approximately 3 months to 2 years after entering the workforce depending on the complexity of their position and work setting. [8] When the transition of occupational therapy (OT) graduates into the workforce was observed by Liddiard,[9] it was noted that graduates felt more confident in the workplace after 5-6 months and participation in an assisting program that promoted role clarity and self-reflection to reduce stress. Of the surveyed UWL graduates, 93.75% (15/16) felt comfortable within 6 months of entering the workforce and 6.25% (1/16) did not feel comfortable at all when the survey was conducted. While the majority of graduates fell within a 6-month average time frame to feel comfortable in a healthcare workplace, the following gave insight on the variation

seen within survey responses based on differences in clinical RTT experience. Details such as receiving a job at their clinical internship site or beginning work soon after graduation were examined; however, no further positive correlations between comfortably trained after entering the workforce and survey data could be found.

A study by Lenards [6] showed that 75% of clinical internship preceptors (n=9) and 66.7% of employers (n=6) agreed that a competency-based education ensures that all medical dosimetry graduates, with or without RTT, have equivalent entry level skills upon graduation. While a majority of preceptors and employers felt that students had the required baseline skills needed upon graduation, students' comfort was subjective. The adaptation of a new role, and consequently a different identity, within the radiation oncology team may demand a longer period of adjustment. In an analysis of registered nurses' transition to nurse practitioners, Barnes[10] stated that the shift from expert status to novice status results in a loss of confidence in one's ability. She asserts that this transition can delay successful role development within the first year of practice. Another possible explanation for the increased adjustment time for RTTs is that RTTs need more time to become proficient critical thinkers in the field of medical dosimetry. A dissertation by Greener[11] concluded that non-RTTs had significantly higher critical thinking skills than RTTs, and that there is a negative correlation between total healthcare experience and critical thinking skills. This suggests that RTTs with experience have lower critical thinking skills as compared to non-RTTs, possibly hindering initial comfort when beginning a career in medical dosimetry where critical thinking skills are essential.

When looking at the responses from all graduating classes it is evident that those who felt very prepared upon graduation required a shorter amount of time to feel comfortable or trained after entering the workforce (Figure 3). Medical dosimetry graduates who felt prepared were confident performing medical dosimetric tasks and thereby took a shorter amount of time to feel comfortable in their new positions. Katowa-Mukwato et al[12] found that confidence in medical students directly correlated with how often a skill was performed and practiced. Therefore, in order to become competent, graduates must have experienced these procedures several times throughout the medical dosimetry education program. If a graduate received more practice performing certain procedures, proficiency and comfort increased. According to retrospective UWL survey data, the two competency procedures graduates felt most confident performing were prostate IMRTs and intact breast tangents. It is likely that graduates were exposed to these

treatment planning techniques most often because prostate cancer has the highest incident among men and breast cancer the highest incident among women in the United States.[13]

Research goal 2

The second goal of this research study was to assess whether satisfaction of a graduate's clinical experience impacted self-perceived preparedness or the time required to feel comfortably trained after entering the workforce. Analysis of retrospective UWL survey data showed that those satisfied with their clinical experience had a high level of self-perceived preparedness upon graduation (Figure 4). A positive correlation existed between those satisfied with their clinical experience and the amount of time required to feel comfortably trained after entering the workforce (Figure 5). Florin et al[14] suggested capability beliefs of nurses upon graduation are influenced during undergraduate studies, including both knowledge and skills obtained during training. This concept can be applied to other competency-based health education systems such as UWL's medical dosimetry program. That is, medical dosimetry students with self-perceived adequate training levels while in school had higher capability beliefs, or confidence, upon graduation. This ultimately led to a shorter time frame needed to achieve comfort in the medical dosimetry profession. In a similar fashion, if the graduates had a higher level of perceived adequate training and subsequently a satisfactory clinical experience, the graduates felt more prepared upon entering the work force.

Research goal 3

The third goal of this research study was to determine if relocating post-graduation impacted the time required to feel comfortably trained after entering the workforce. As previously stated in research goal one, a study considering "practice readiness" of newly graduated Canadian nurses found that preparedness in the workplace was generally felt approximately 3 months to 2 years after entering the workforce depending on the complexity of their position and work setting. [8] Although a majority of graduates felt comfortably trained within an average time frame compared to other healthcare professionals, variations seen in the UWL graduates' responses could in part be due to differing workplace complexity. According to the retrospective UWL survey data, graduates who received medical dosimetry jobs at their internship site felt comfortably trained in a shorter amount of time after entering the workforce than those who received jobs elsewhere. Of the graduates who received a job at their clinical internship site, 100% (7/7) felt comfortable within a 6-month time frame (Figure 6). Of the

graduates who received a job somewhere besides their clinical internship site, 88.89% (8/9) felt comfortable within a 6-month time frame and 11.1% (1/9) reported not feeling comfortable at all by the time the survey was conducted. While the radiation oncology community has produced tremendous strides in standardizing care, different clinics can treat similar cancers in a variety of ways. Continuing work at a graduate's internship site allows for familiarity with the attending physicians, treatment planning systems, and work flow of the department. The year spent as a student in this location would have been a sufficient amount of time for the individual to feel comfortable in these surroundings. When the transition of occupational therapy (OT) graduates into the workforce was observed by Liddiard[9], it was noted that graduates felt more confident in the workplace after 5-6 months and participation in an assisting program that promoted role clarity and self-reflection to reduce stress. While UWL graduates were not participating in a post-graduation transitional assisting program, perhaps those graduates that did not receive a position at their clinical internship site would have experienced decreased levels of stress and in turn a shorter time frame to feel comfortably trained if such programs were in place for more allied health disciplines. The fact that 93.75% (15/16) of graduates were operating the same treatment planning system used during their clinical internship and 91.67% (33/36) were working full time as medical dosimetrists at the time the survey was administered similarly helped graduates to feel more prepared and decreased time required to feel comfortably trained in their first jobs due to the element of familiarity.

Conclusion

The field of medical dosimetry is constantly evolving and entrance into the profession is becoming more stringent as the MDCB now requires both a bachelor's degree and completion of a JRCERT accredited program for certification eligibility. As the standards of the medical dosimetry profession increase, it is prudent to find the optimal way of educating aspiring medical dosimetrists. A lack of published data concerning medical dosimetry graduates' level of self-perceived preparedness upon graduation and time required to feel comfortably trained after entering the workforce created a demand for additional investigation. This study was conducted to determine what factors affected a graduate's level of self-perceived preparedness upon graduation and time required to feel comfortably trained after entering the workforce. With the aid of retrospective post-graduate surveys, significance of clinical radiation therapy experience

and formal dosimetry education were assessed regarding their ability to produce confident graduates.

Qualitative, comparative data analysis indicated several factors in a graduate's education that influenced self-perceived preparedness upon graduation and comfort after entering the workforce. Prior RTT clinical experience made a positive impact on a medical dosimetry graduate's self-perceived degree of preparedness upon graduation. The time required for RTTs with clinical experience to feel comfortably trained in the medical dosimetry position was longer than RTTs without clinical experience and graduates with no RTT experience. Graduates satisfied with the clinical experience required less time to feel comfortably trained in a medical dosimetry position than those who were somewhat satisfied with the clinical experience. A high degree of clinical internship satisfaction also correlated to increased levels of self-perceived preparedness. Furthermore, receiving a job at the graduates' clinical internship site caused graduates to feel more comfortable as a new medical dosimetrist compared to graduates that had to get acquainted with a different environment.

Based on the study results, further research regarding graduates' self-perceived preparedness and time required to feel comfortably trained after entering the workforce should be conducted with a larger population. It would be beneficial to provide similar survey questions to a larger sample size because an increased sample size allows for more in-depth statistical analysis and accurate comparison of the factors. Perhaps the survey could be issued to graduates of other medical dosimetry programs to validate trends observed in this study and help facilitate gaining a larger population. While comfort levels after entering the workforce are highly subjective, obtaining an average length of time for graduates' comfort after entering the workforce specific to allied health or radiation oncology professions would be beneficial in setting standards or training benchmarks. Additionally, whether RTTs with clinical experience have an advantage over those graduates with no clinical RTT experience simply due to exposure in radiation oncology for a longer period of time should be considered. This was a retrospective study based on a small group of graduates from a single educational program and therefore may not be generalized to all medical dosimetry graduates.

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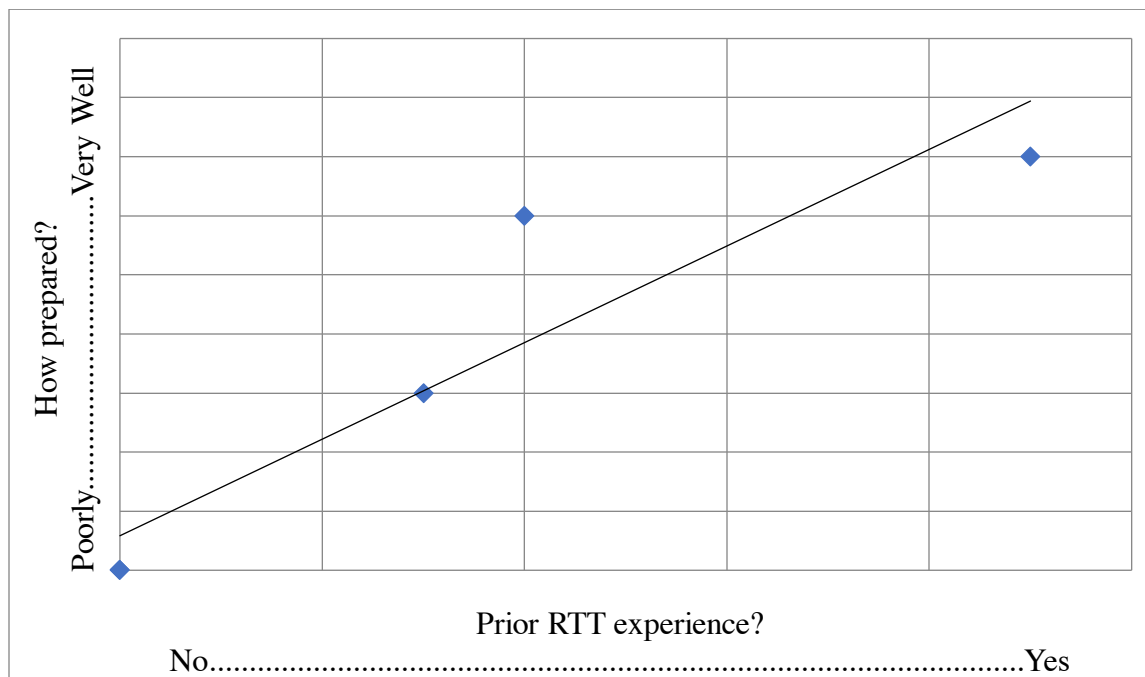
Figures

Figure 1. Graphical representation comparing answer responses to "How prepared do you think you were for your job?" (n=16) and if the student had prior RTT experience (n=16).
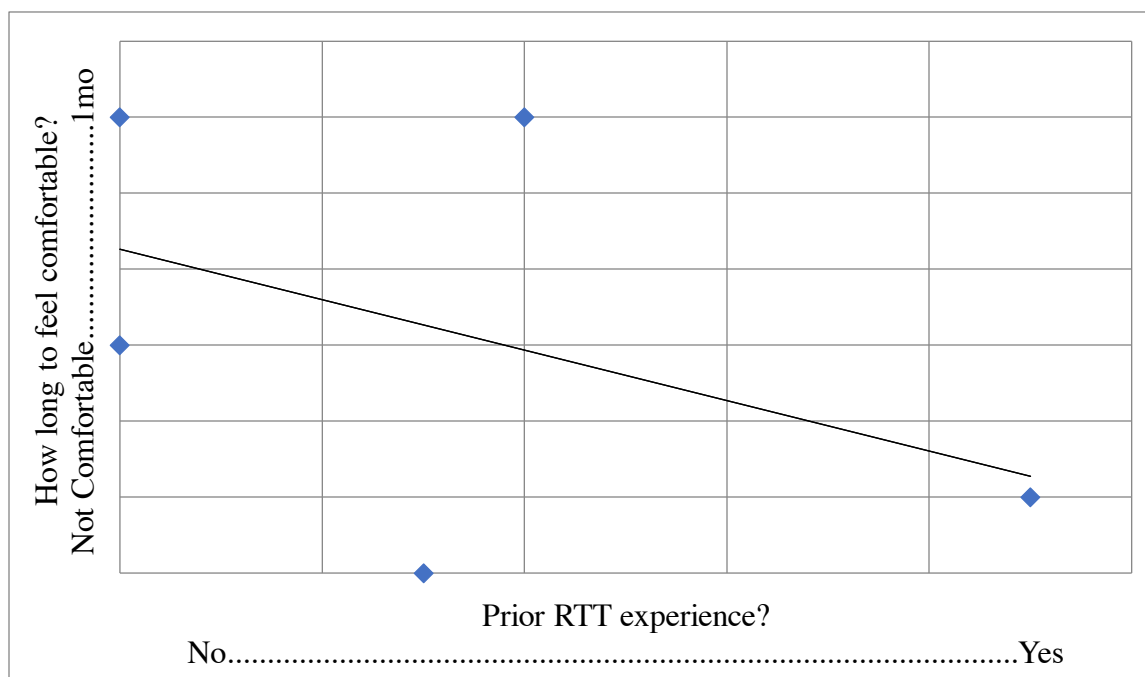

Figure 2. Graphical representation comparing answer responses to "How long did it take you to feel comfortable or trained?" (n=16) and if the student had prior RTT experience (n=16).
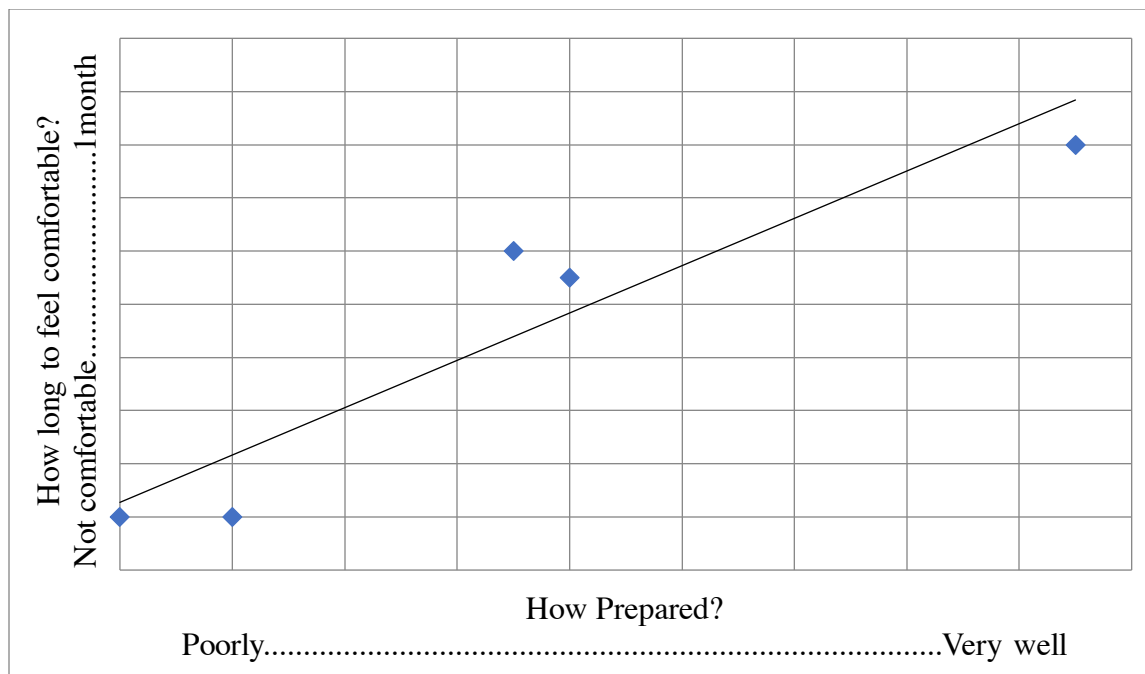
Figure 3. Graphical representation comparing answer responses to "How prepared do you think you were for your job?" (n=34) and "How long did it take you to feel comfortable or trained?" (n=43).
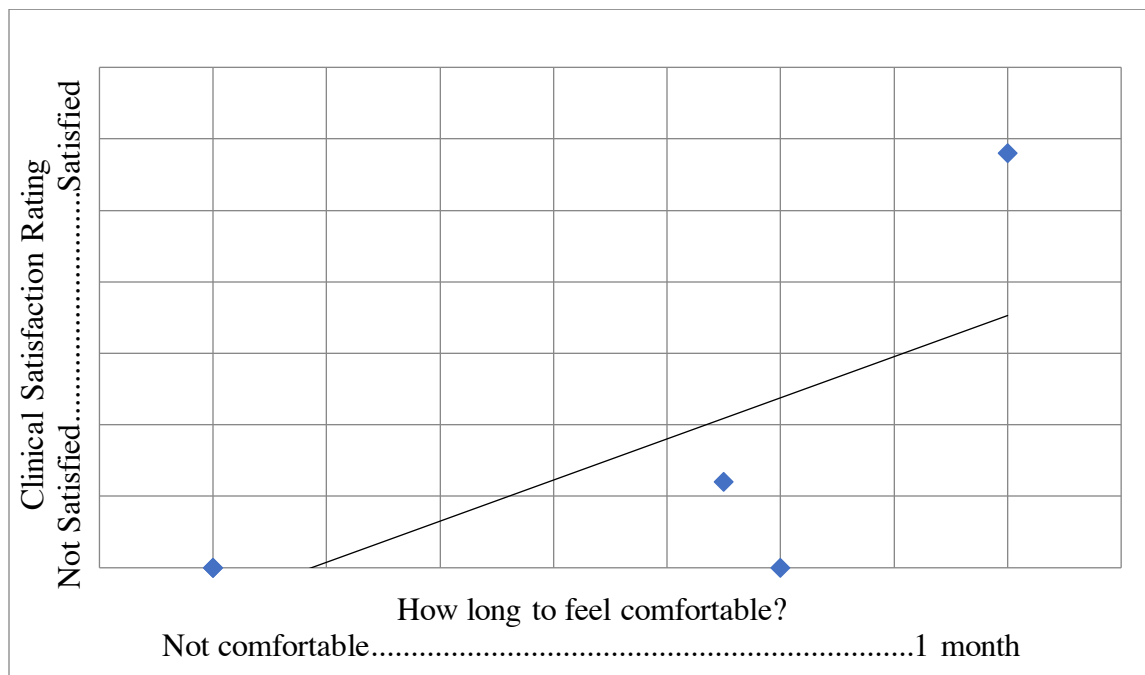

Figure 4. Graphical representation comparing answer responses to "How long did it take you to feel comfortable or trained?" (n=43) and rating of clinical satisfaction (n=35).
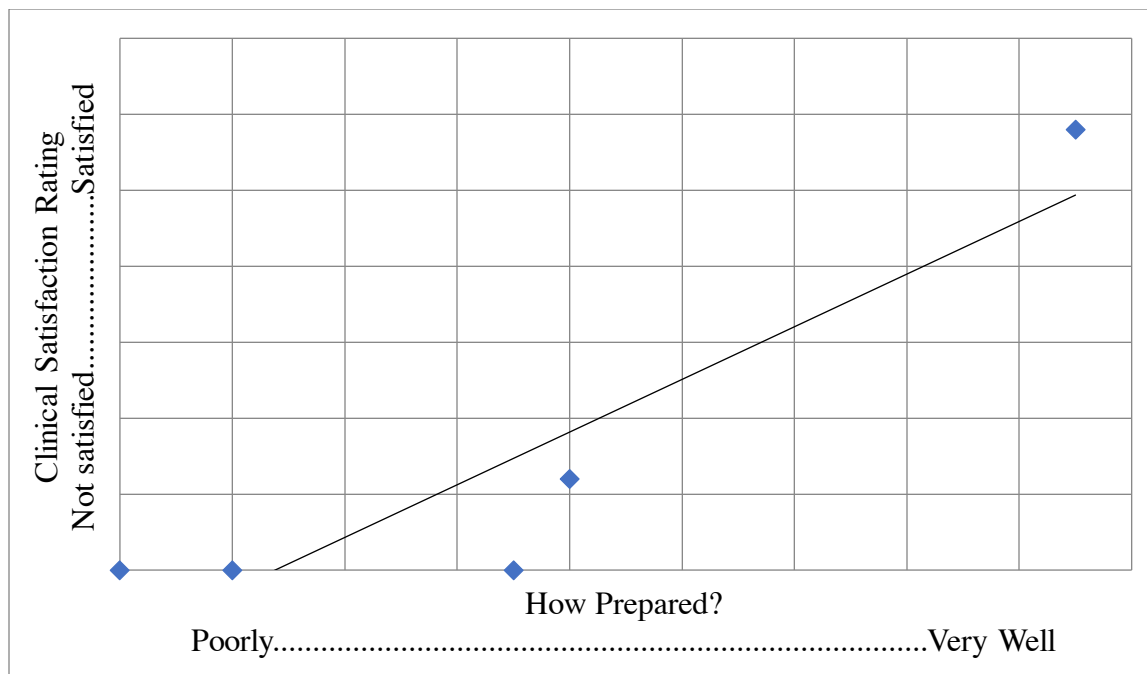
Figure 5. Graphical representation comparing answer responses to "How prepared do you think you were for your job?" (n=34) and rating of clinical satisfaction (n=35).
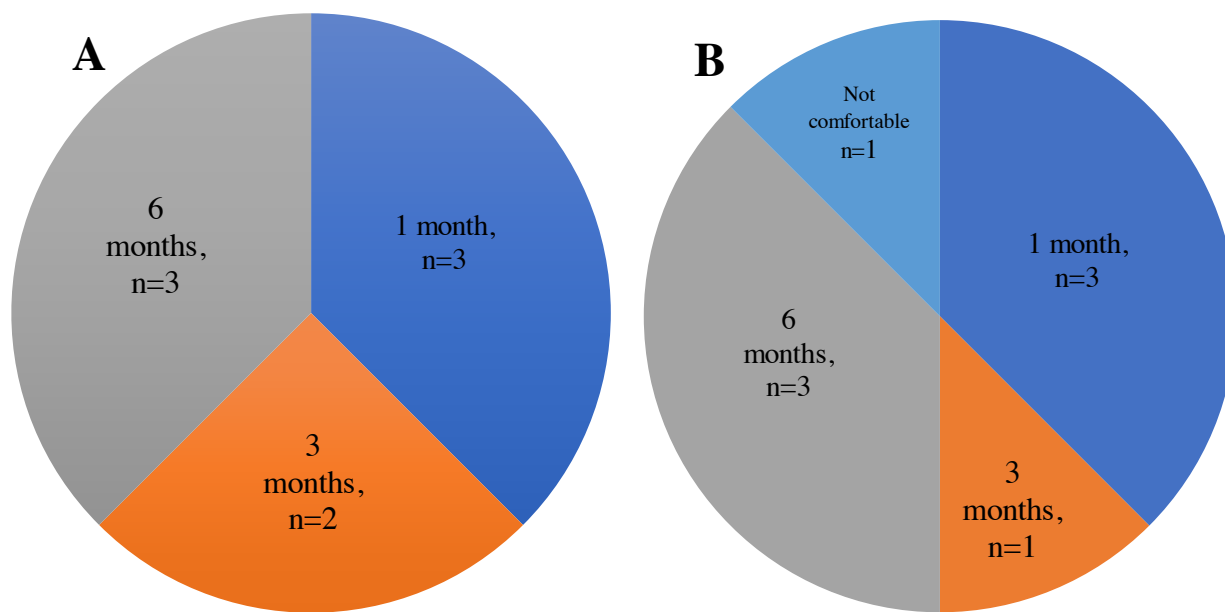

Figure 6. Graduate responses when asked "How long did it take you feel comfortable or trained in your position?" Graph A represents those who received a job at their clinical internship site (n=8) while graph B represents those who did not (n=8).