

Analysis of medical dosimetry graduates' level of preparedness when entering the workforce

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Abstract

Introduction

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.¹ 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, in 2017 the Medical Dosimetrist Certification Board (MDCB) decided that 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.² The premise of this report is that the training a student receives from their elected programs affects their confidence and success as a new medical dosimetrist.

For the safety of radiation therapy patients, it is of utmost importance to ensure medical dosimetry students receive adequate training. Educational programs are responsible for producing competent graduates who are capable of designing quality treatment plans. To successfully do so, programs must focus on improving areas where graduates feel most unprepared. Analyzing the way in which successful graduates prepared can be beneficial to future aspiring medical dosimetrists as well. Knowing the training background of the most confident medical dosimetry graduates will help prospective students plan their clinical and didactic pathways.

Currently, there is a lack of published data concerning how the training medical dosimetry students receive affects their degrees of readiness when entering the workforce. Baker et al³ reported the need for investigations concerning the relationship of previous work

experience as a radiation therapist and its effect on success of a dosimetry student. A survey conducted by Mills⁴ acknowledges 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. Lenards⁵ provided evidence supporting the need for student confidence at the completion of a medical dosimetry program.

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 registered radiation therapists (RTTs) with a bachelor's degree and Track B for bachelor's degree recipients without prior radiation therapy experience. Since students are separated into individual internship sites, each has a unique clinical experience. Different approaches can be evaluated to see which process creates the most prepared student. Surveys from a pool of past graduates were utilized to provide insight into factors that affect a new medical dosimetrist's confidence level. The purpose of this study was to assess how different aspects of a student's training impacts the student's level of preparedness when entering the workforce.

Methods and Materials

Data was collected from surveys offered to UWL medical dosimetry master's degree recipients from classes 2012 through 2015. As years progressed, the program grew and produced larger cohorts from which to sample. The class of 2012 only had 5 respondents, while the class of 2015 yielded 16 respondents. A total sample size of 43 graduates was employed for this retrospective cohort study. Though each survey covered a variety of topics, this study concentrated on factors that could potentially influence a graduate's level of preparedness when approaching the graduate's first medical dosimetry job. These factors were deemed significant or not significant based upon influence on the graduate's perceived confidence.

Specific questions were chosen to assess the training a student received before and during the student's formal medical dosimetry program. Currently, most medical dosimetry programs only consider credentialed radiation therapists for admission. Surveying UWL graduates was advantageous because the population consisted of RTT and non-RTT students. With information from both groups, the time required to become comfortable performing medical dosimetry duties independently was compared. Due to the fact that prior RTT experience was not a question on

each class survey, this factor was reviewed in terms of individual responses from only the class that graduated in 2015.

To evaluate aspects of program effectiveness, the relationship between the level of confidence and satisfaction of an individual's internship site was reviewed. Whether the internship site hired the new graduate was then recorded to track the confidence level of medical dosimetrists that were not affected by the adjustment period associated with relocating. The effect of relocating to a site with a different treatment planning system was considered to see if adapting to a new treatment planning system decreased confidence. Additionally, the time that lapsed before the start of graduates' first full-time job was examined to determine whether or not a break could produce a lack of confidence in their abilities. Finally, a ranking of treatment procedures graduates felt most comfortable to least comfortable planning was established.

Results

The majority of total respondents, 37.21%, felt comfortable or trained in their position after 1 month (Figure 1). Over 90% of the population felt comfortable or trained within 6 months of beginning their position. Therefore, only 9.3% of the population (4 respondents) required more than 6 months to feel comfortable or did not feel properly trained when the survey was conducted. Half of the individuals surveyed felt very well prepared for their job after graduation (Figure 2). 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".

Of the 16 students enrolled in the graduating class of 2015, 9 students had previously worked as a radiation therapist (Figure 3a, b). The amount of experience ranged from 4 years to 20 years with the average number of years working as a radiation therapist of 8.5. The responses from this cohort served as a basis for the evaluation of how RTT experience affects preparation for a career in medical dosimetry.

Exactly half of the students in the class of 2015 were employed by their clinical internship site upon graduation (Figure 4). When the survey was collected, 15 graduates were operating the same treatment planning system used during their clinical internship (Figure 5). Of the 36 survey responses regarding current employment status, 33 were working full time as medical dosimetrists (Figure 6). Within the remaining 3 responses, there was exactly one

individual in the residual options of working part time, per diem, or not in the field of medical dosimetry.

The average level of confidence for the competency procedures performed during clinical internship resulted in 85.39% of respondents able to perform the designated task with confidence (Figure 7). The procedure with the highest level of confidence, 95.19%, was prostate Intensity Modulated Radiation Therapy (IMRT) planning. The procedure with the lowest level of confidence, 29.21%, was brachytherapy planning. Brachytherapy planning is not as readily available to all students and is not a job requirement for the majority of medical dosimetrists.

Discussion

The purpose of this retrospective cohort study was to analyze factors that affect a medical dosimetry student's comfort level when entering the workforce. The impact of training prior to admission into a medical dosimetry program was the first factor examined; particularly, if experience as a radiation therapist decreased the time required to feel comfortable or improved perceived level of preparedness in medical dosimetry school graduates. The degree of preparation attained while enrolled in an educational program was also related to time required for the graduate to become comfortable as a working medical dosimetrist. Then, satisfaction level of an individual's internship experience was compared to the degree of comfort sensed upon graduation.

Mills⁴ reported that the majority of medical dosimetrists thought that entrance to a medical dosimetry program should require an RTT certification as well as a bachelor's degree. Somewhat contradictory, Baker et al³ reported no statistical significance between prior RTT experience and successful completion of a medical dosimetry program. Analysis of UWL surveys showed that those with prior RTT experience required a longer amount of time to feel comfortably trained as medical dosimetrists than those without RTT experience (Figure 8, 9). Prior RTT experience, for the purpose of this study, was defined as an individual holding a position as a radiation therapist for any given time. Those with a valid RTT degree, but no clinical application of the degree, were not included in this subset. The adaptation of a new role, and consequently a different identity, within the radiation oncology team may demand a longer period of adjustment. It is also possible that the meticulous mindset cultivated by experience as a RTT requires more time to be applied to the field of medical dosimetry. Successful RTTs are

masters of their trade; their level of comfort in medical dosimetry may be gauged by the time required to achieve the same high-degree of proficiency experienced as a RTT.

According to UWL surveys, those with prior RTT experience felt more prepared for their medical dosimetry jobs than those without RTT experience (Figure 10, 11). Experienced RTTs have a solid foundational knowledge of radiation oncology. The intricacies and workflow within a radiation oncology department are understood and that knowledge can be applied to medical dosimetric treatment planning options. Ultimately, this results in a more comprehensive learning experience and higher degree of preparation.

After completing medical dosimetry school, those who felt very prepared required a shorter amount of time to become comfortable in the new medical dosimetry position (Figure 12). Preparation included competence in skills necessary for the job, meaning medical dosimetry students who felt prepared were capable of performing medical dosimetric tasks. Katowa-Mukwato et al⁶ found that confidence (in medical students) directly correlated with how often a skill was performed and practiced. Therefore, in order to become competent, students must have experienced these procedures several times throughout the training program. If a student receives more practice at the internship site, proficiency increases. Consequently, students that practice medical dosimetric tasks most often felt comfortable in a shorter amount of time than those who did not practice the necessary skills.

Those who felt very well-prepared for medical dosimetry jobs were also satisfied with the clinical experience (Figure 13). Consequently, a positive correlation existed between those satisfied with the clinical experience and the amount of time required to feel comfortable in a medical dosimetry position (Figure 14). Florin et al⁷ suggested capability beliefs of nurses upon graduation are influenced during undergraduate studies, including both knowledge and skill obtained during training. This concept can be applied to other competency-based health education systems such as UWL's medical dosimetry program. Therefore, medical dosimetry students with 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 comfortability in the medical dosimetry profession.

Graduates who received jobs at their internship sites felt comfortable with the position in a shorter amount of time than those who received jobs elsewhere (Figure 15, 16). The prevalence of peer-reviewed journals and annual meetings within the radiation oncology

community has produced tremendous strides in the sharing of best practices. However, this field is far from standardized and 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 necessary time required to become comfortable at the same site of a student's clinical internship would have already passed upon transition to the new role of staff medical dosimetrist.

Conclusion

The field of medical dosimetry is constantly evolving and entrance into this profession is becoming more stringent; 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 training aspiring medical dosimetrists. A lack of published data concerning the success of medical dosimetry student training created a demand for additional investigation and justified this research. This study was conducted to determine what factors affect a graduate's confidence level and ultimately the degree of preparedness when encountering the first job opportunity. With the aid of post-graduate surveys, training prior-to and during a formal dosimetry education was assessed for effectiveness.

Prior RTT experience made a positive impact on a medical dosimetry graduate's perceived degree of preparedness when entering the workforce. However, the time required for prior RTTs to feel comfortable or trained in the medical dosimetry position was longer than non-RTT graduates. Experience working within the realm of radiation oncology and understanding intricacies involved with successful treatment of cancer patients may account for this increased level of confidence. On the contrary, adopting a new position within a radiation oncology team could require extra effort from the graduate and initially lead to a longer adjustment period.

Qualitative data analysis and comparative graphs indicated several factors in a student's education that positively influenced confidence as a newly employed medical dosimetrist. Students satisfied with the clinical experience required less time to feel comfortable in a medical dosimetry position than those who were somewhat satisfied with the clinical experience. A high degree of internship satisfaction also correlated to increased levels of self-perceived preparedness. Furthermore, receiving a job at the students' clinical internship site made

graduates feel more comfortable as new medical dosimetrists when compared to graduates that had to get acquainted with a different environment.

Based on the results achieved from this survey, further research evaluating factors affecting a graduate's level of preparedness should be conducted. It would be beneficial to provide the same survey, following the same amount of post-graduation time, to a larger sample size. Perhaps the survey can be issued to graduates of other medical dosimetry programs to validate trends observed in this study. An increased sample size allows for more in-depth statistical analysis and accurate comparison of the factors. The reason that experienced RTTs required more time to feel comfortable as medical dosimetrists can also be investigated. With a correlation between RTT experience and increased levels of preparedness, additional studies to determine the optimal amount of radiation therapy training for dosimetrists could be useful. Additionally, the idea that RTTs have an advantage over non-RTTs because of exposure to radiation oncology for a longer period of time should be considered. In order to verify the benefits of RTT experience, additional studies to compare performance level of RTT and non-RTT medical dosimetrists with similar exposures to radiation oncology could be performed. Specifics regarding the reason certain internship sites received higher satisfaction scores than others must also be explored. The results of this study are not conclusive, but serve as a good starting point and basis for further research.

References

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Figures

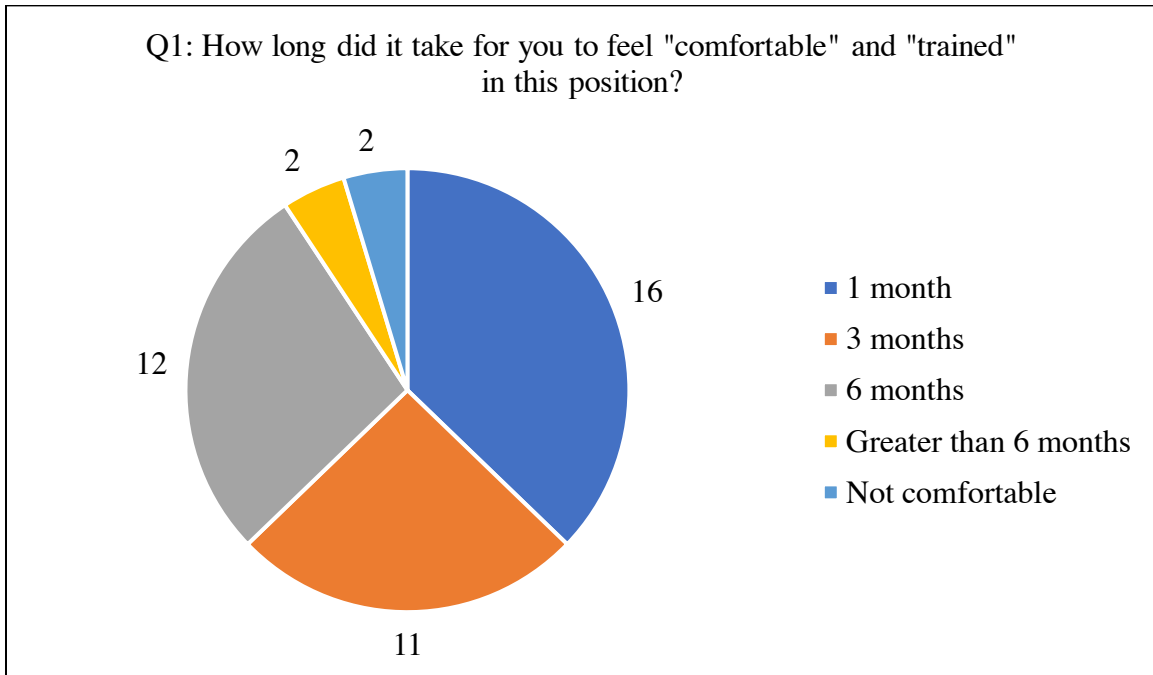


Figure 1. Graphical representation of responses for question one, “How long did it take for you to feel “comfortable” and “trained” in this position?”

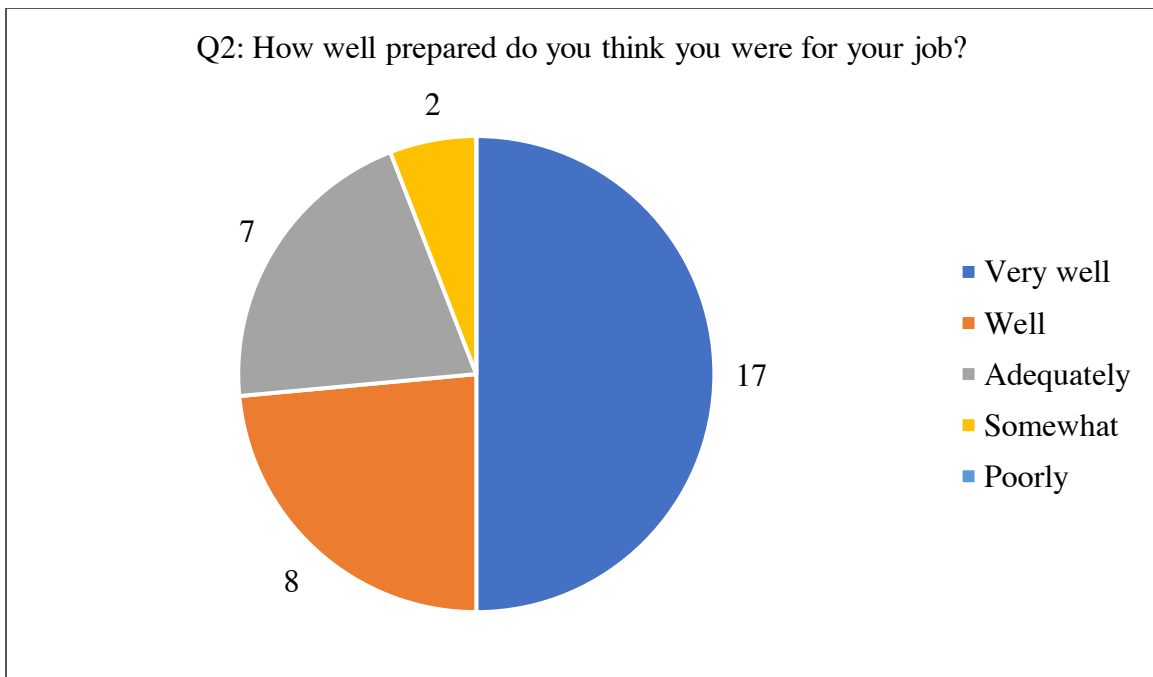


Figure 2. Graphical representation of responses for question two, “How well prepared do you think you were for your job?”

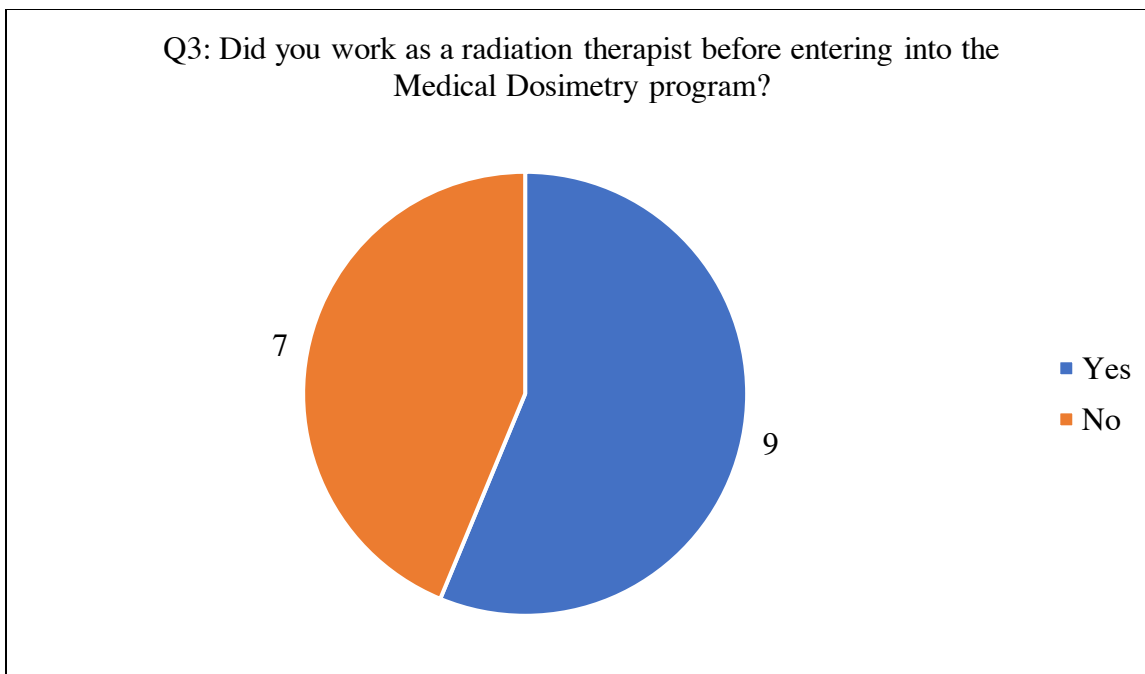


Figure 3a. Graphical representation of responses for question three, “Did you work as a radiation therapist before entering into the Medical Dosimetry program?”

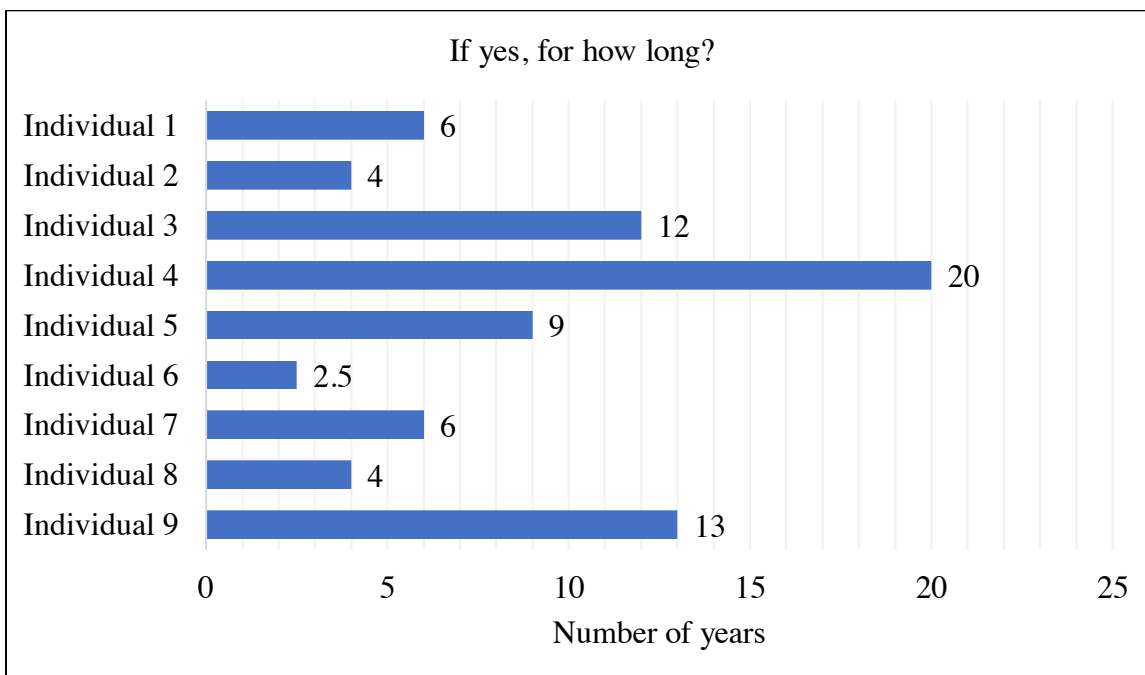


Figure 3b. Graphical representation of the responses for the second part of question three, “If yes, for how long?”. The average number of years of prior RTT experience is 8.5 years.

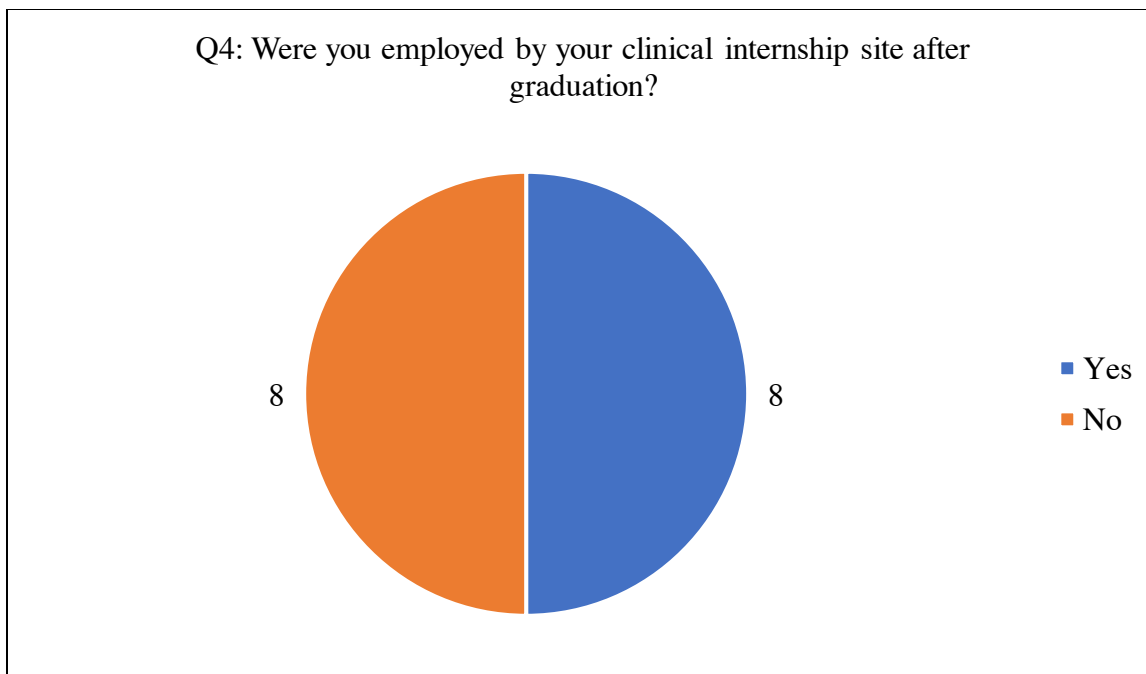


Figure 4. Graphical representation of responses for question four, “Were you employed by your clinical internship site after graduation?”

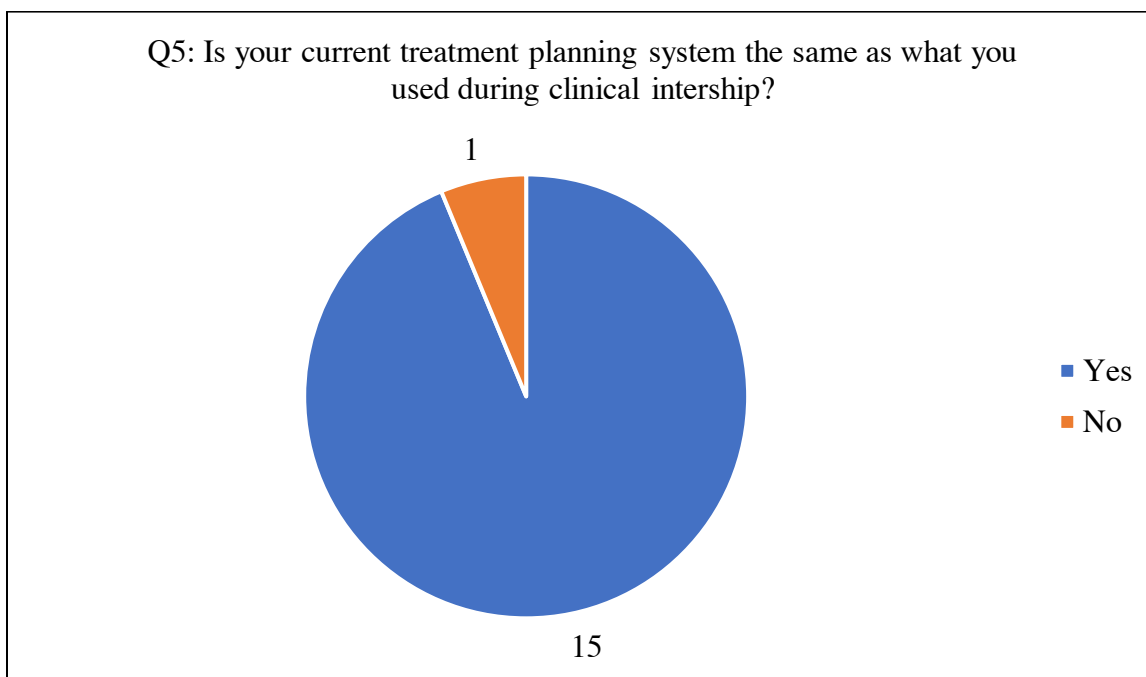


Figure 5. Graphical representation of responses for question five, “Is your current treatment planning system the same as what you used during clinical internship?”

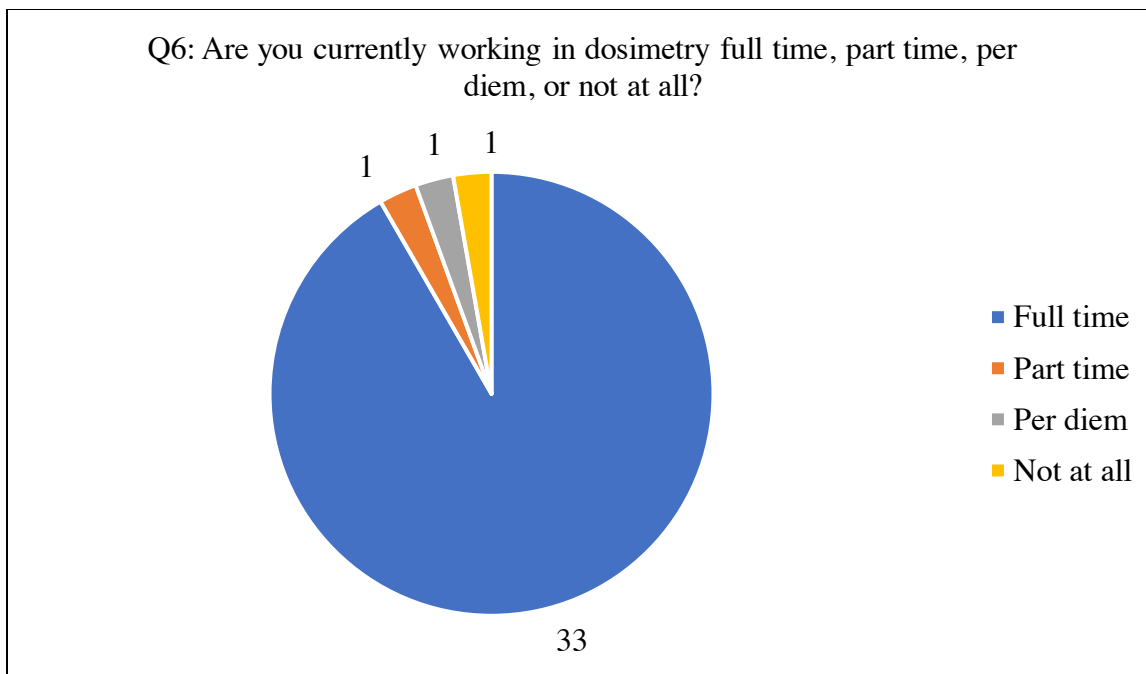


Figure 6. Graphical representation of responses for question six, “Are you currently working in dosimetry full time, part time, per diem, or not at all?”

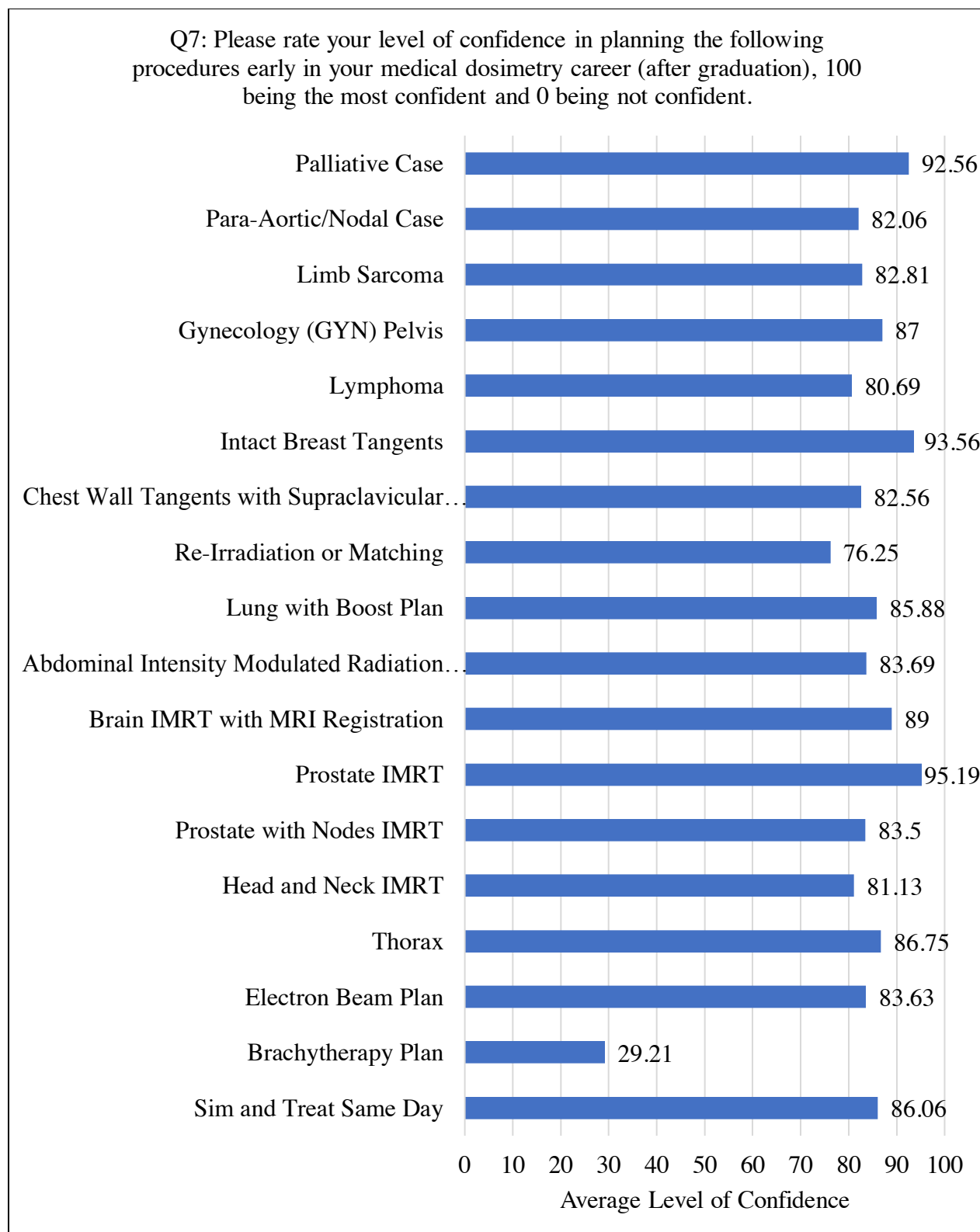


Figure 7. Graphical representation of responses for question seven, “Please rate your level of confidence in planning the following procedures early in your medical dosimetry career (after graduation), 100 being most confident and 0 being not confident.”

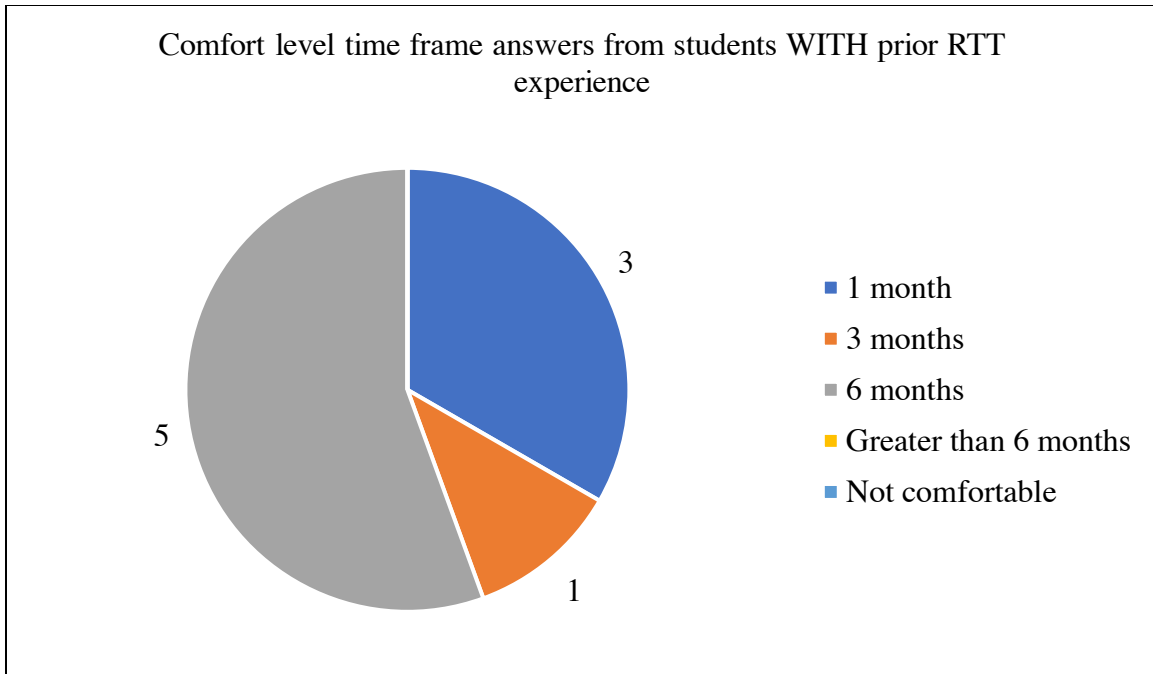


Figure 8. Graphical representation of an individual's comfort level time frame with prior RTT experience.

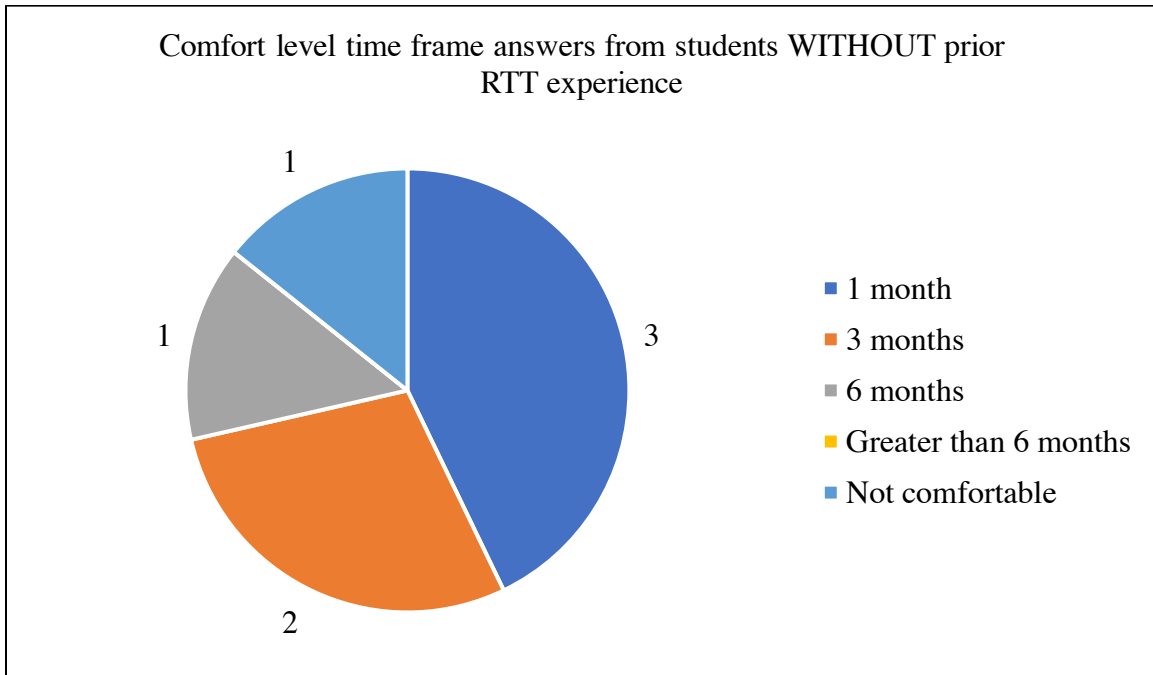


Figure 9. Graphical representation of an individual's comfort level time frame without prior RTT experience.

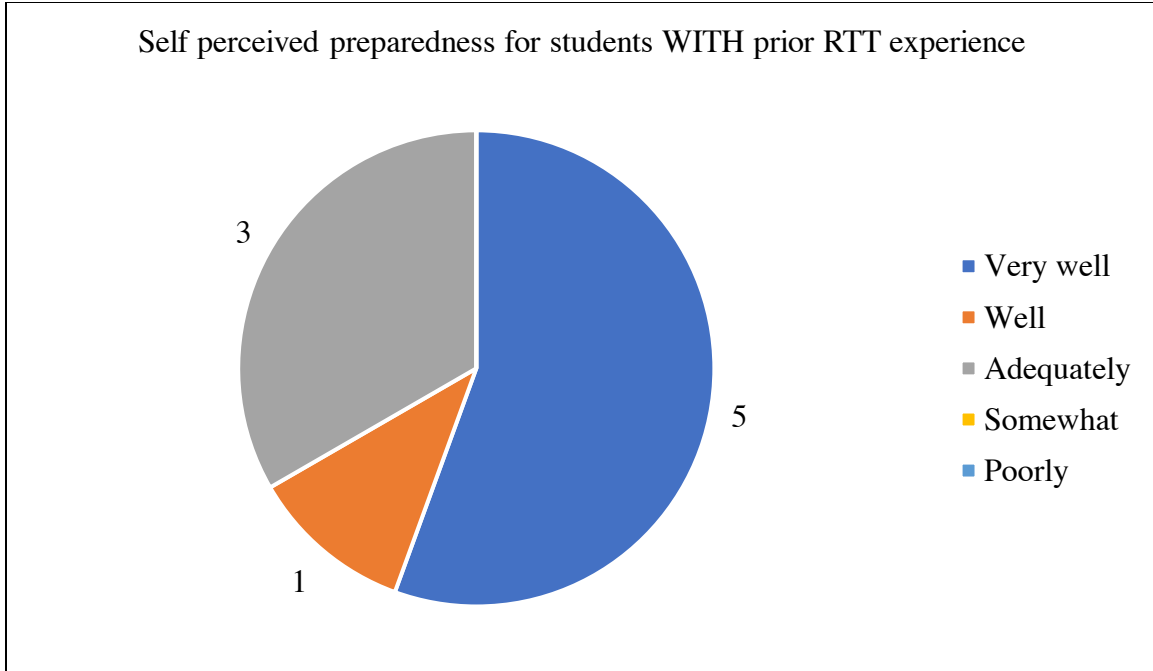


Figure 10. Graphical representation of an individual's self-perceived preparedness when they have prior RTT experience.

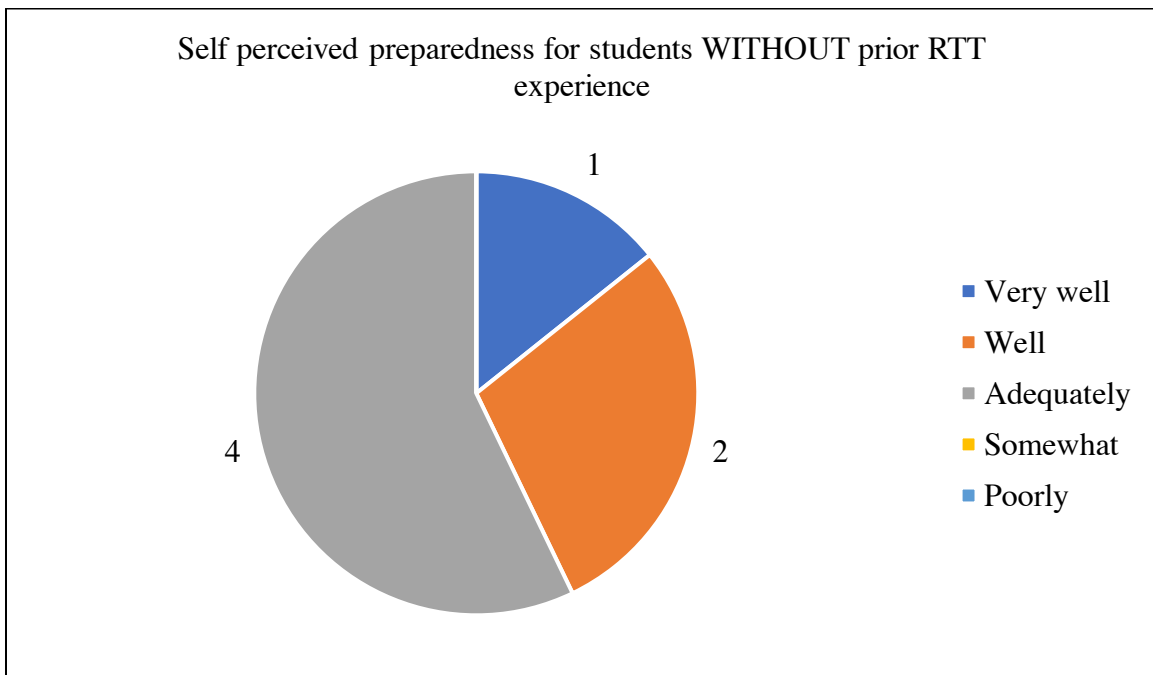


Figure 11. Graphical representation of an individual's self-perceived preparedness when they do not have prior RTT experience.

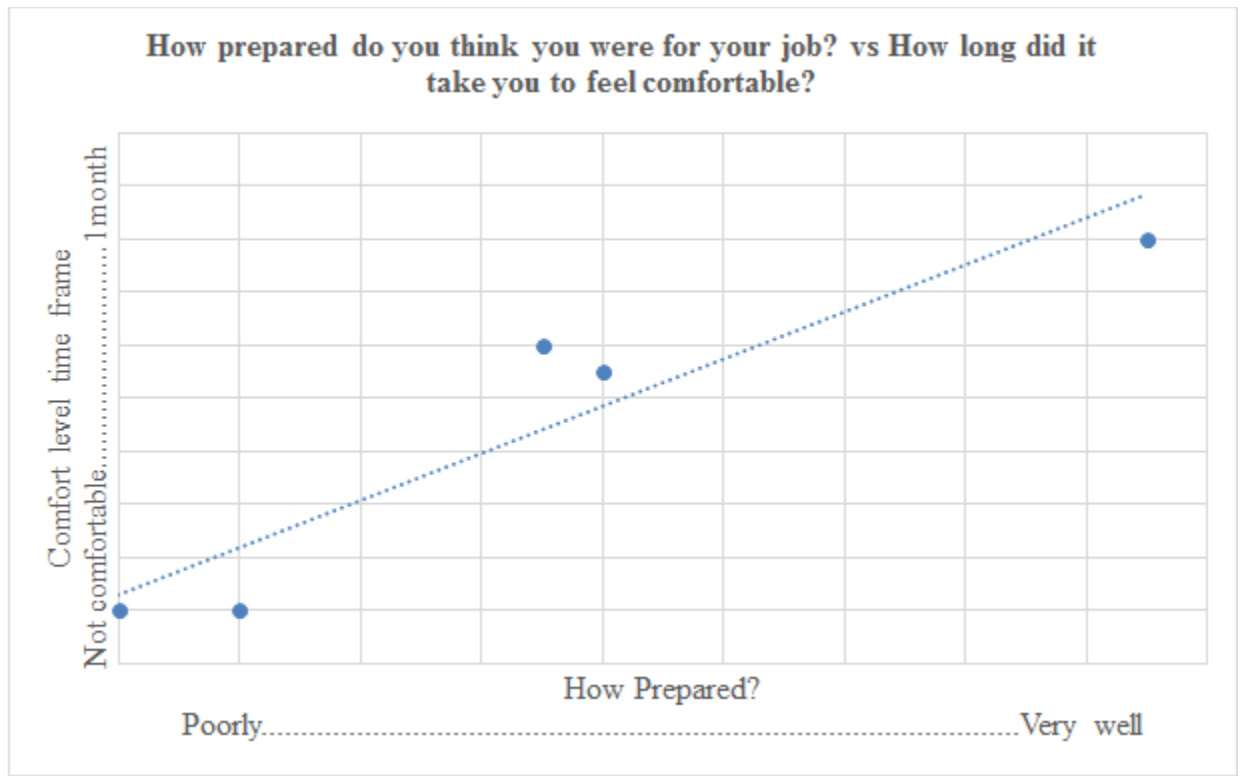


Figure 12. Graphical representation comparing answer responses to “How prepared do you think you were for your job?” and “How long did it take you to feel comfortable or trained?”

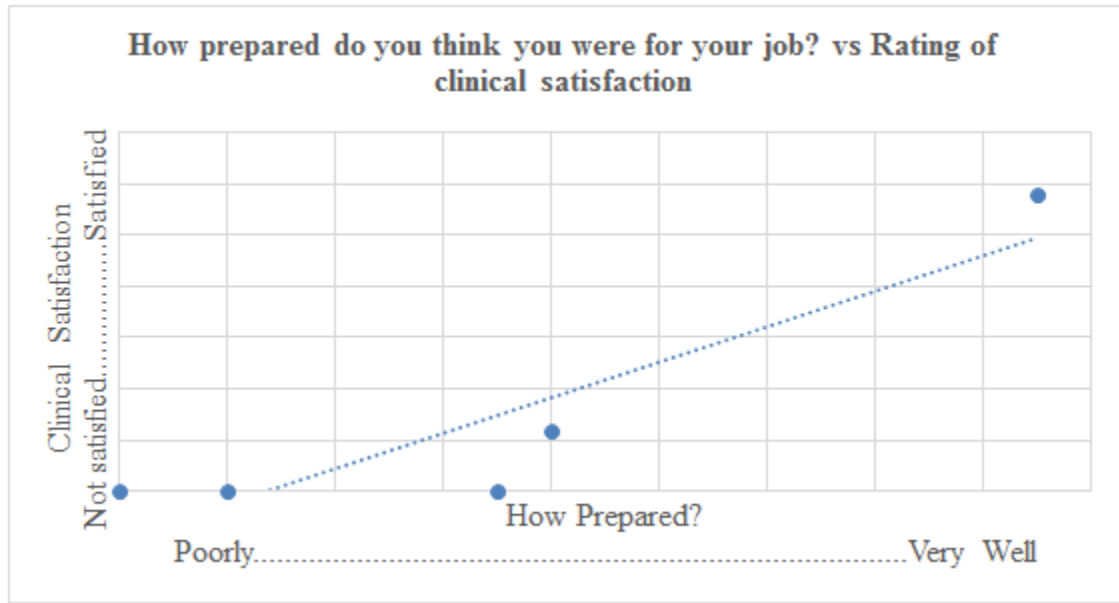


Figure 13. Graphical representation comparing answer responses to “How prepared do you think you were for your job?” and rating of clinical satisfaction.

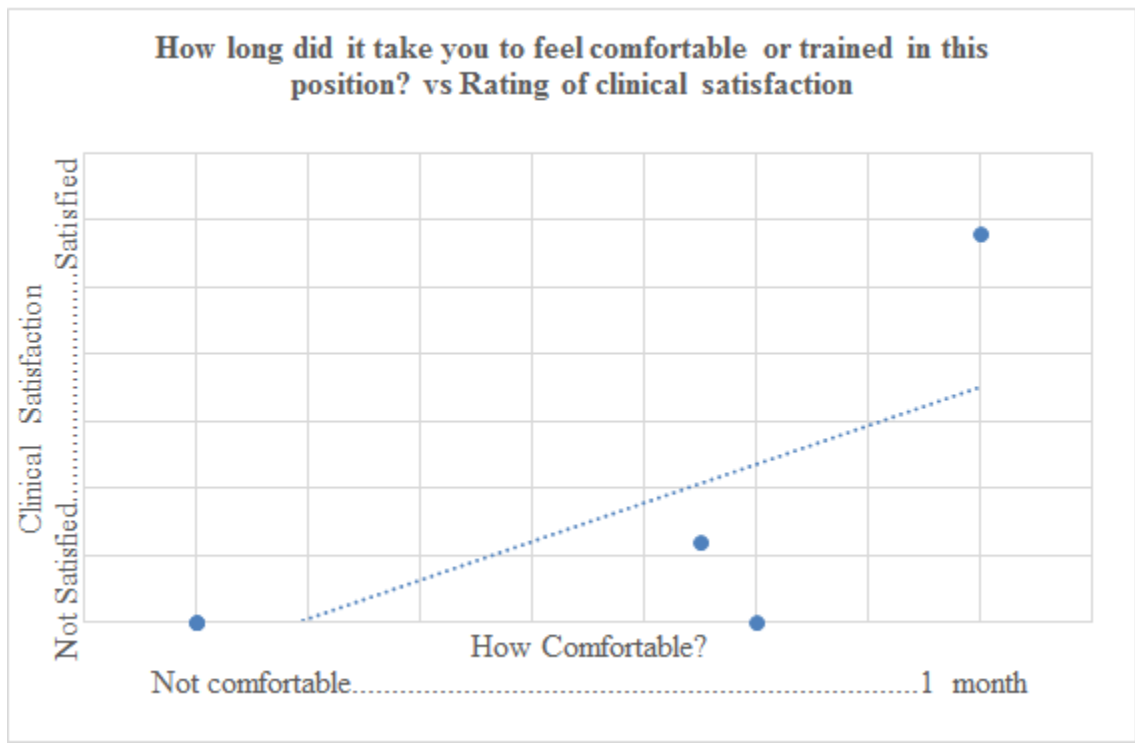


Figure 14. Graphical representation comparing answer responses to “How long did it take you to feel comfortable or trained?” and rating of clinical satisfaction.

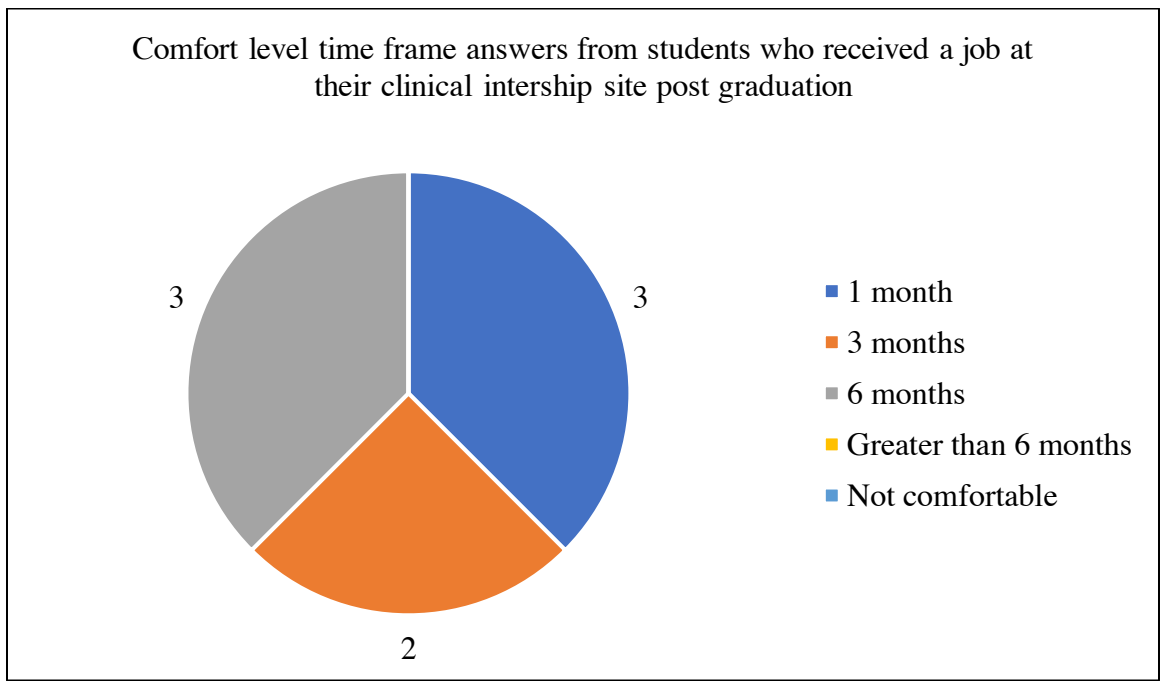


Figure 15. Graphical representation of an individual’s comfort level time frame when they did receive a job at their clinical internship upon graduating.

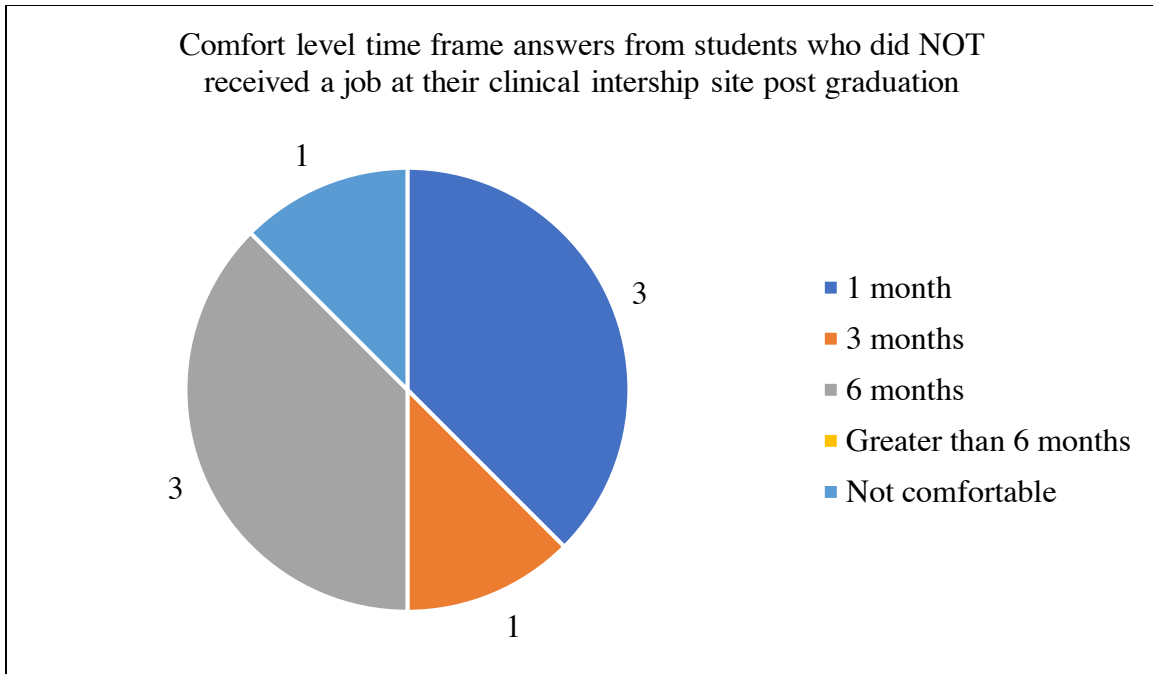


Figure 16. Graphical representation of an individual's comfort level time frame when they did not receive a job at their clinical internship upon graduating.