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The Continuing Umbrella of Research Experiences (CURE): A Model for Training Underserved Scientists in Cancer Research

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Abstract

Mentoring is a critical aspect of research and training; and the adoption of a successful mentoring model for guiding researchers through the educational pipeline is lacking. The Continuing Umbrella of Research Experiences (CURE) program was established in the Comprehensive Minority Biomedical Branch; which is part of the National Cancer Institute. This program offers unique training and career development opportunities to enhance diversity in cancer research. The CURE initiative focuses on broadening the cadre of underserved investigators engaging in cancer research. CURE begins with high school students and fosters scientific, academic and research excellence throughout the trainee's educational progression. The program supports students throughout the entirety of their training career. During this period, the trainee matures into a competitive early stage investigator; capable of securing advanced research project funding in academic and industry workforces. Thus, the CURE program provides a comprehensive vehicle for training and reinforces the critical mass of underserved investigators conducting cancer research.

Keywords

Minority; Diversity; Training; Cancer; Research; Biomedical research; Underrepresented; Underserved

Introduction

There is a disproportionate incidence in the morbidity and mortality of cancer for minorities and other underserved groups despite significant gains in cancer screening, diagnosis, and treatment. This is in part due to the lack of minority and underserved physicians and

investigators in positions with the ability to make an impact on addressing cancer health disparities [1]. Underrepresented individuals in science and engineering have been historically defined as African-American, Alaskan Natives, Native Americans, Hispanic Americans, and Native Pacific Islanders [2]. Underserved groups, as it is used in this article, encompasses a broader group and is collectively used to refer to underrepresented racial and ethnic minorities, individuals with disabilities, and individuals from disadvantaged backgrounds (low socioeconomic status, rural or remote communities, and first generation college students). Increasing the nation's cadre of racially and ethnically diverse researchers is a crucial component in eliminating health disparities since they are often the driving force behind minority-related research [3,4]. Minorities and other underserved groups often face barriers that their majority counterparts never encounter and are deterred from careers in science by inadequate preparation, scarcity of role models, low expectations, and unfamiliarity with the culture and idioms of science [5]. Inadequate mentoring and training has consistently been identified as a critical barrier to the success in higher educational settings [6]. Yet, there is a paucity in the literature addressing mentoring and training as a vehicle to increasing underserved researchers and a lack of working models that have produced independent scientific researchers in the cancer field [7]. Mentoring is a critical aspect of research and training; and the adoption of a successful mentoring model for guiding researchers through the educational pipeline is lacking. Therefore, since traditional mentoring and training programs have not been successful or have limited success on increasing the cadre of competitive minority biomedical researchers it becomes imperative that a new training and mentoring model surface to address these issues [8].

Importance of Mentoring for Underserved Scientists

Underserved groups are generally not provided with the experiences and opportunities that would help achieve successful professional endeavors and often require extra encouragement and assistance in pursuing and continuing science careers [9]. Without the cultural capital needed and strong advocacy from people with a clear understanding and cultural sensitivity to the obstacles faced by underserved researchers who serve as role models and links to the broader research community, it is difficult for junior scientists to navigate through the educational pipeline leading to independence [10]. As such, mentoring and training become critical tools in the educational and professional pipeline of underserved researchers. Mentoring has consistently been shown to be a critical component in the acculturation and integration of young scientists from underserved and disadvantaged backgrounds. This type of mentoring is defined as a learning partnership founded on encouragement and support, the ability of personal and professional growth and development, and a reciprocal dynamic relationship between mentor and trainee, extending to the availability and resources of the funding organization.

Continuing Umbrella of Research Experiences Approach: Reach, Engage, and Launch

The Continuing Umbrella of Research Experiences (CURE) program was developed to broaden the participation in cancer-related research and training activities by underserved groups through a *reach, engage, and launch* approach of mentoring and training across the educational spectrum. One of the successes and differences of the CURE program in comparison with previous models has been the broad-based holistic approach in handling every aspect of underserved education and training needs. CURE outlines three main goals: (1) to establish and maintain the pipeline of young investigators from underserved group by expanding the pool and extending the period of training and career development, (2) increase the cadre of researchers from underserved populations who can compete successfully for independent research project grants, (3) emphasize strategic and scientific

areas of greatest need (e.g., basic, clinical, and translational research, behavioral and population sciences, and emerging technologies). In addition to substantial training and mentoring, the CURE training program includes events such as an annual Professional Development and Peer Review Workshop, which focuses on providing information pertaining to grantsmanship, effective career trajectory strategies, and the peer review process. These areas are associated as barriers precluding the success and accrual of competitive research funding for underserved groups. Ultimately, through mentoring, training and funding; CURE has provided a novel paradigm for the development of independent competitive cancer researchers. The program has effectively and efficiently combined supplements to larger grant mechanisms, e. g., R01, as well as individual competitive funding to provide continuous support to meritorious applicants. CURE utilizes a two-pronged approach (Fig. 1) by providing individual competitive funding mechanisms for specific stages of the pipeline, such as predoctoral (National Research Service Award Fellowship) and postdoctoral and junior investigator levels (Career Development or K Awards) and by utilizing Research Supplements to Promote Diversity in Health-Related Research to provide support from high school until research independence is obtained.

Expanding and Extending the Period of Training: Career Development Awards

Although the CURE portfolio consists of students spanning from all points of the educational pipeline; impactful evidence of the effectiveness and sustainability of the CURE program is present in the Career Development Award to Promote Diversity or diversity K awards. One clear distinction between the CURE program and other attempts at increasing the cadre of qualified cancer researchers is the awareness of the need for a prolonged period of mentoring and training for underserved researchers to develop the skills required to become competitive researchers. Investigators funded by diversity K awards are supported for 3 to 5 years under the tutelage of a primary mentor to serve as role model and guide. The primary mentor is usually part of a mentoring team, comprised of two to four well-funded experienced scientists with a proven record of training and mentoring in the disciplines of focus. This team assists the trainee in developing exceptional laboratory/clinical expertise and also builds a broad network of collaborators. The diversity K Awards allow trainees to develop grantsmanship, acquire data for manuscript publications, and ultimately gain independence.

Diversity Career Development

The K portfolio consists of four distinct types of diversity career development awards and is part of the Diversity Training Branch at the National Cancer Institute's Center to Reduce Cancer Health Disparities (CRCHD). Three of the K Awards are mentored (K01, K08 and K23), and the K22 is a nonmentored award. The diversity career development award portfolio was initiated in the former Comprehensive Minority Biomedical Branch with the release of the K01 and K08 in 1997, followed by the K23 in 2000 and the K22 in 2001, all of which provide grantees 3 to 5 years of funded support under the tutelage of an experienced mentor. The most recent K22 award mechanism, launched in 2001, serves as a bridge for previously mentored K awardees to provide sufficient time to obtain the preliminary data necessary for a Research Project Grant (R01 or equivalent) as an independent scientific researcher. The expectation of the diversity K awards is that through this sustained period of research, career development, mentoring, and training; awardees will launch independent careers and become competitive for new research project grants (R01). Recipients of diversity career development awards also participate in unique mentored peer review experience; thus fulfilling the goal to increase the number of minorities who serve on study sections and review committees. The K01 supports candidates

that have a research or health professional doctoral degree; the K08 provides an intensive, supervised research experience for health professionals to acquire research expertise to pursue a career in laboratory-based biomedical cancer research; the K23 encourages research-oriented clinicians to develop independent research skills and gain experience in advanced methods and experimental approaches needed to conduct patient-oriented research; lastly, the K22 provides protected time and support for individuals who are advanced postdoctoral and/or newly independent research scientists who have been in an independent position for less than 2 years at the time of application. The number of diversity K awards has significantly increased over the years. In 2009, the Exploratory Grant Award to Promote Workforce Diversity In Basic Cancer Research (R21) was added to the portfolio. The diversity R21 is focused on the basic biology of cancer and provides a bridge to investigators that have completed their training and may need additional preliminary data to develop a full R01 proposal. In sum, more than 160 grantees have been supported utilizing diversity K award mechanisms from 2002 to 2009.

Awards

CURE Accomplishments: Past and Present

The success of the CURE program is evidenced by the accomplishments of past diversity Career Development trainees (Fig. 2). As these awardees have moved forward with their careers, they have obtained position and status throughout academia and medicine. In addition, all of the former awardees and the majority of the current awardees have significantly contributed to the expertise and diversity of the NIH peer review system. Investigators have served on over 190 review panels and contributed well over 17,000 days of review service. Awardees have also proven to be prolific contributors to the scientific literature with well over 1,600 publications in various peer reviewed medical and scientific journals. The average success rate at the NCI for an R01 is 18.5% http://report.nih.gov/success_rates/index.aspx. Out of the current diversity K portfolio, greater than 30% have gone on to procure independent R01 funding since 2005. This success rate is largely due to the requirement that diversity K22 grantees submit an R01 application prior to the conclusion of their second year of funding and that mentored K grantees are strongly encouraged to submit an R01 prior to the end of the funding period. K grantees have not only been successful in reaching independence in highly competitive fields but have, in turn, become mentors to a new generation of students, thereby fulfilling the program's primary objective of increasing the nation's cadre of racially and ethnically diverse cancer researchers.

Important Qualities of a Mentor/Mentee

The implementation of the CURE program has reinforced that there are certain qualities and characteristics that are crucial in forming a successful mentor–mentee–program director relationship (Fig. 3). Many grantees in the diversity K portfolio have echoed that important qualities to look for in a mentor include: a successful career trajectory, grantsmanship, scientific expertise, interdisciplinary opportunities, accessibility, encouragement, networking abilities, and a sincere interest in the success of the trainee. In addition, since no one person may know or be able to provide all that a mentee may require, multiple mentors have been essential in fulfilling the different aspects, whether personal or professional of the CURE mentees. The duo must be open and willing to learn from each other and have good communication skills that will lead to a productive working environment. The isolation, stereotypes, and barriers to communication that may be faced by minority trainees are real issues that may be contended with by sensitivity and cultural awareness on the part of the mentors, who serve as both role models and advocates. Additionally, CURE trainees have reported the strong relationship with the NCI CRCHD Program Directors as being one of the

biggest assets in their mentoring relationship. The Program Directors were said to be instrumental in navigating the grant application and supporting adequate opportunities for career development and accrual of funds. Questionnaires were distributed at the 2009 Career Development and Peer Review Workshop held by the CRCHD for current grantees regarding mentoring. There was an 80% return rate of the surveys distributed. Although 90% of the respondents who returned the questionnaires characterized the value of mentoring as “very important” in their career development, only 44% reported having a strong mentor-trainee relationship.

Many of the grantees responded that having a mentor who set clear goals and who was concerned about their career development was important. Grantees also reported that having access to their mentor, especially one who was senior and experienced in grantsmanship, was critical to a successful relationship. Conversely, grantees who reported that their mentors were overcommitted and spent little time with them cited this as the greatest obstacle in the mentor–trainee relationship. In general, limited time commitment from the mentor translated to limited productivity on the part of the mentee. Interestingly, 67% of the grantees responded they were currently mentoring one or more students themselves and attempting to provide guidance as a way of helping others less experienced to advance.

A Look to the Future

The main aim of this article has been to provide a brief detailing of the CURE program and philosophy. The continuing vision is that this program will continue to support underserved investigators at critical junctures in their professional careers, while identifying and supporting talent at all levels of the educational pipeline. It is anticipated that the program will continue to support and infuse a steady flow of stellar cancer investigators to the academic and biomedical scientific community. Through mentoring, training, and funding mechanisms, CURE has and will continue to provide the opportunities necessary for trainees to launch careers as independent researchers. These individuals, in turn, are the future and will become mentors and role models for the next generation of researchers.

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Fig. 1. A schematic of the CURE paradigm, which includes individual grant funding mechanisms and CURE supplements

Fig. 2.
Career progression and titles associated with grantees from the diversity career development portfolio

Fig. 3.
A schematic depiction of the entities present in an optimal mentoring model