

The United States Navy and Employees with Cancer: The Time for Change Is Now

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Abstract—The US Navy, including the US Marine Corps and Naval Nuclear Propulsion Program (NNPP), has a robust radiological protection and monitoring program meeting (and typically exceeding, in the name of conservatism) federal law requirements. The program covers the variety of ways in which the Navy produces and uses ionizing radiation and radioactive sources: in medicine, nuclear ship propulsion and repair, industrial and aircraft radiography, and myriad other unique uses in carrying out its vital mission. In executing these programs, thousands of people across the world are employed as active-duty Sailors and Marines, government civilians, and government contractors. These workers include physicians, reactor operators, radiation safety officers, and nuclear repair workers, to name but a few. The health protection standards for these workers are promulgated in the publicly available Navy Medicine P-5055 Radiation Health Protection Manual (NAVMED P-5055), published February 2011 with Change 2 published December 2022, and are applicable to Navy and Marine Corps and NNPP radiation protection programs. The NAVMED P-5055 outlines the individual medical requirements for those qualified and able to receive exposure to ionizing radiation as part of their duties and requires that “Radiation workers receive focused medical examinations to establish whether or not cancer is present which would medically disqualify a person from receiving occupational radiation exposure.” Additionally, without scientific or medical basis, the NAVMED P-5055 requires disqualifying those employees who have a history of cancer, cancer therapy, radiation therapy including radiopharmaceuticals received for therapeutic purposes, or bone marrow suppression from drawing dosimetry, entering radiation areas, or handling radioactive material. This policy, which exists regardless of lifetime occupational radiation dose or projected future radiation dose, applies to all cancers except adequately treated basal cell carcinoma. The policy is not supported by relevant scientific and medical literature; does not align with reasonable professional ethical standards; does not conform to US Navy radiological training, which stipulates the assumed increased risk of developing cancer from Navy and Marine Corps and NNPP occupational radiation exposure is small; and removes critical leadership and mentoring

capability from the workforce unnecessarily. This article discusses in detail (1) this policy and its ramifications to the Navy and Marine Corps and NNPP workforce and (2) recommendations, benefits, and impacts for the Navy and Marine Corps and NNPP to remove this policy and still maintain a robust radiation protection program. *Health Phys.* 125(2):147–151; 2023

Key words: cancer; health effects; occupational safety; safety standards

INTRODUCTION AND BACKGROUND

PER THE Navy Medicine P-5055 Radiation Health Protection Manual (NAVMED P-5055⁷ of February 2011 with Change 2 published December 2022, the US Navy, including the US Marine Corps and Naval Nuclear Propulsion Program (NNPP), has established a Radiation Health Program with the purpose to “preserve and maintain the health of personnel while they accomplish necessary and purposeful work in or around areas contaminated with radioactive material, or in areas where they are exposed to ionizing radiation.” Radiation workers in the Navy and Marine Corps and NNPP are administratively limited to a quarterly and annual occupational dose below the federal limit, with incremental increases as required up to a maximum of 30 mSv per quarter or 50 mSv y⁻¹. A medical surveillance program performs radiation medical examinations (RMEs) to monitor radiation workers’ health with an emphasis on detecting indications of cancer and bone marrow suppression as required in NAVMED P-5055 chapter 2. Section 2-1 paragraph 2 specifically requires that: “Radiation workers receive focused medical examinations to establish whether or not cancer is present which would medically disqualify a person from receiving occupational radiation exposure.” However, no basis is given for this qualification standard. Navy medicine or contracted medical providers perform RMEs at no cost to radiation workers. As such, the RMEs are considered by some to be a benefit and may provide important medical information such as early detection of adverse medical

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⁷Available at <https://www.med.navy.mil/Directives/All-Pubs-and-Manuals/>. Accessed 27 March 2023.

conditions that might otherwise be overlooked or missed. There exist detractors to these RMEs, including taxpayer cost estimated in the millions of dollars annually, using Navy Medicine resources for unnecessary healthcare expenses that could be used in other areas vital to national defense, the deferring of more thorough cancer screenings through a patient's primary care manager to these periodic surveillance exams, and the required performance of uncomfortable and invasive exams when current medical guidelines may not indicate they be performed. An in-depth discussion of the pros and cons of RMEs is outside the scope of this article. In addition to radiation workers who receive RMEs, many other employees are classified as limited radiation workers, non-radiation workers, or emergency responders who are limited to an annual dose of 1 mSv (the federal limit for members of the public) yet still require intermittent access into radiation areas. These employees do not require an RME as a condition of employment but are required by policy to self-report any potentially disqualifying medical condition including cancer, even considering the restrictive dose limits mentioned above. Upon reporting, they are subjected to the same disqualification from duties around radioactive materials or within radiation areas.

When a finding on an RME leads to a diagnosis of cancer or another disqualifying condition, or an employee self-reports a diagnosis of cancer or another disqualifying condition, NAVMED P-5055 requires disqualification from radiological work and restriction from drawing dosimetry, entering radiation areas, or handling radioactive material. In some cases the attending physician or oncologist may recommend no further occupational radiation exposure based on a lack of knowledge regarding radiation biology, an abundance of caution, or other reasons. In other situations, the requirements in NAVMED P-5055 remove the employee's ability to make their own informed choices regarding their healthcare in an occupational and industrial setting.

The policy exists and is enforced regardless of other cancer risk factors (e.g., smoking, family history, general health) and regardless of cumulative occupational radiation dose. The employee may be requalified once the cancer is treated and/or the employee is free from disease (in remission) as determined by the attending medical provider and administratively approved through Navy Medicine's Radiation Effects Advisory Board (REAB). Only during the REAB's administrative review process is cumulative occupational dose considered, although the authors are not aware of an instance when cumulative occupational dose was the deciding factor in the consideration as to whether or not to medically requalify an employee. The administrative review by the REAB of a post-treatment cancer survivor also does not consider the possibility or probability of a second primary cancer (SPC). The review simply results in a finding of physically qualified (PQ) or not physically qualified

(NPQ) for returning to radiation worker status due to the absence of cancer (thus: PQ) or the presence of cancer (thus: NPQ) at the time of submission. Regardless, once the employee is deemed PQ by the REAB post-treatment, they are permitted to again receive occupational radiation exposure, thus diminishing the significance of this policy as part of a relevant risk or radiation protection posture, or to minimize likelihood of future litigation.

DISCUSSION

Multiple epidemiologic studies involving Navy active duty Sailors and civilians (Charpentier et al. 1993; Greenberg et al. 1985; Kublae et al. 2005; Matanoski et al. 2008, 1991; Rinsky et al. 1981, 1988; Schubauer-Berigan et al. 2007; Silver et al. 2004; Stern et al. 1986; Yiin et al. 2007) have not shown evidence of a link between Navy and Marine Corps and NNPP occupational radiation exposure levels and an elevated incidence of cancer. This conclusion is not new, is not localized to the Navy and Marine Corps and NNPP population set, and is widely understood in the radiation protection field—thus undermining any scientific or medical precedence for this policy's relevance in protecting the workforce. A further literature review indicates an increased likelihood of SPC after radiation therapy for the treatment of disease (NCRP 2011) but no evidence for a similar increase of SPC with continued occupational radiation exposure within federal limits or a relationship between occupational radiation exposure and progression of an existing cancer.

There is no precedent elsewhere in the United States, including other military branches, the US Environmental Protection Agency, the US Nuclear Regulatory Commission, or industry insurers, to disqualify a person based solely on the presence of cancer without regard to the disease progression, location, etiology, or if the worker is otherwise capable of performing their assigned duties. In contrast, a qualified commercial reactor operator may be disqualified for a spinal cord or brain tumor that could incapacitate them while on watch at the reactor plant control panel but would not be disqualified, for example, simply for the presence of a squamous cell carcinoma or chronic lymphocytic leukemia. In the vast majority of cases within the Navy and Marine Corps and NNPP, cancer would not otherwise impact the employee's ability to perform their job in a radiation area and/or perform functions that require radiological monitoring. In fact, in virtually every instance, the disqualified individual is still fully employed but performs no direct radiological work; they are typically moved laterally in the organization, most times without their input or consent, to a position not requiring further exposure to ionizing radiation. If held in their current position, they are no longer permitted access to radiation areas or work around radioactive

materials, which decreases their effectiveness and mission impact as an employee.

From a holistic cost-benefit view, this policy provides much cost with the only tangible benefits being those that may be afforded by the RME and health data collecting for future population and epidemiological study publications. However, the RME and health data collecting could continue even if the disqualification policy is rescinded.

The policy removes critical leadership and mentorship from those actually performing skilled radiological work where and when it is needed most—later in employees' careers when they are more experienced and in management and mentoring positions—due to the right-skewed age distribution of cancer. American Cancer Society (ACS) statistics published in the Cancer Facts and Figures 2021 report (ACS 2021) indicate invasive cancer onset probability approximately doubling for males from age 50–59 y when compared with age from birth to 49 y (females indicate only a slight increase in probability); approximately doubling for males and females from age 60–69 y when compared with age 50–59 y; and a lifetime probability of 40.5% for males and 38.9% for females. With a probable later age of cancer onset, those senior members of the Navy and Marine Corps and NNPP team who are highly skilled, experienced, and likely in management and mentoring positions are the employees most commonly disqualified.

Stage 1 or stage 0, in the case of chronic lymphocytic leukemia using the Rai staging system, cancers may linger for several years without progressing, where the oncologist's treatment may include monitoring only.⁸ These employees remain disqualified for this prolonged period of time, possibly through the end of their normal employment, unable to directly mentor and assist other qualified radiation workers. The disqualified employees are stuck in a loop where their oncologist may not advise treatment, yet to continue to perform radiological work they may have to seek treatment against medical advice to become cancer-free and be found PQ by the REAB.

NAVMED P-5055 training for radiation workers instructs that occupational radiation exposure criteria are based upon the concept that there may be some degree of risk from any level of radiation exposure. This training aligns with US industry standards and relative law in following the linear no-threshold (LNT) model of cancer risk assessment. However, even the assumed small increase in cancer risk from this occupational radiation exposure does not logically imply disqualifying those employees with cancer. The increased risk is negligible in comparison to the US baseline cancer incidence rate of approximately 40% over a

lifetime (ACS 2021). The NNPP, from both their Navy and Department of Energy work, takes great care to maintain positive worker and public opinion about the safety of shipboard reactor construction, operation, overhaul, and decommissioning; and indeed, the safety and environmental protection record is impeccable. However, disqualifying those employees with cancer generates negative worker and public opinion, and further, the policy can cause the perceived risks associated with Navy and Marine Corps and NNPP occupational radiation exposure to be exaggerated.

The lack of industry precedent for this policy, absence of basis for its implementation, extended career impact for those impacted by it, and conflict with existing training standards raises serious ethical and legal consequences for its existence.

Ramifications of this policy

Consider a reasonable hypothetical situation: a 51-year-old male nuclear engineer who entered Navy (NNPP) employment as a nuclear submarine mechanic and was classified as a radiation worker at 25 y old, is now diagnosed with stage 1 prostate cancer (not found on RME). He has had 6 RMEs where he was found PQ for radiation work based on no adverse findings of cancer or bone marrow suppression (see Fig. 1). The patient was building a career for 26 y. Now he is placed into an administrative assignment where he will not enter radiation areas, work on radioactive systems, handle radioactive material, nor provide jobsite mentoring to the next generation of nuclear submarine mechanics, even though stage 1 prostate cancer does not impact his ability to do his job. The patient's oncologist does not advise any treatment or therapy at this point and the ongoing medical care includes monitoring every 6 mo. At 5-y post-diagnosis, the patient is advised to seek treatment, undergoes external beam radiation therapy (EBRT) of 40 fractions of 2 Gy each, is deemed cancer-free, and is returned to radiation worker status after an administrative review of his condition by the REAB (that is, the REAB finds him PQ based on the absence of cancer). In the intervening 5 y between diagnosis and treatment, the patient suffered because his disqualification presented an extra hurdle for promotion, he was assigned a different job, and was likely ineligible for overtime hours if desired; and the organization suffered because his critical skills and mentorship were removed from the submarine maintenance area where they were most valuable.

This hypothetical man was exposed to low levels of occupational radiation for 26 y prior to his cancer diagnosis. Only once the cancer was diagnosed was he removed, without his consent or request for reasonable accommodations, from duties as a radiation worker. In following the LNT model, the assumed risk of cancer was incurred during his 26 y of occupational radiation exposure within federal limits

⁸ More information on the chronic lymphocytic leukemia Rai staging system is available at: <https://www.cancer.org/cancer/chronic-lymphocytic-leukemia/detection-diagnosis-staging/staging.html>. Accessed 27 March 2023.

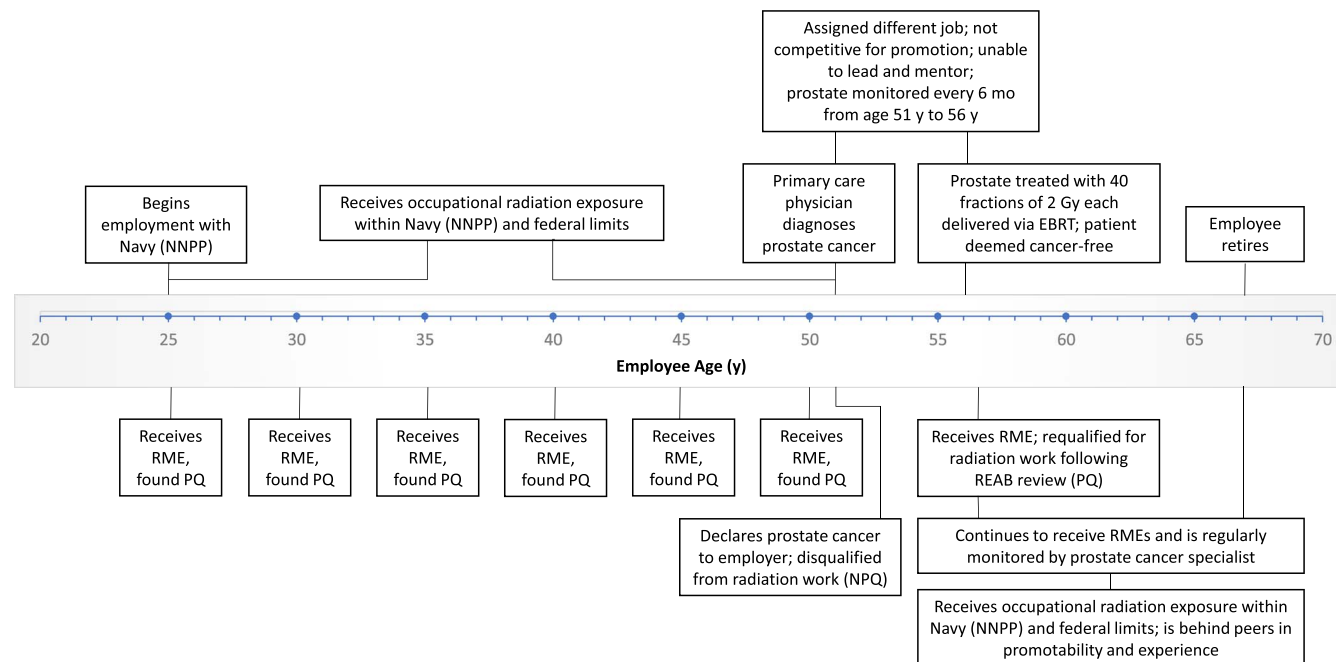


Fig. 1. Nuclear submarine mechanic hypothetical situation timeline.

prior to his diagnosis and disqualification, not during the time he was diagnosed with cancer. Removing further occupational radiation exposure only during the time he is diagnosed with cancer, and the REAB subsequently permitting him to receive further occupational radiation exposure once deemed cancer-free, is not a logical strategy for the purposes of maintaining a robust radiation protection program or maintaining a posture that minimizes the risk of future legal claims.

Real-life examples of career-impacting disqualifications are plentiful across all nuclear-capable shipyards and operations of the NNPP, in Navy hospitals and medical clinics, and Navy radiography facilities. Other timelines, outcomes, and consequences with which the lead author is familiar include an employee retiring prior to treatment and not reaching their full career potential. An employee received poor performance evaluations in part from being moved without requesting reassignment to another division within the organization (following diagnosis of cancer) and eventually was terminated. An employee sought treatment for an early-stage cancer against medical advice to continue their career (where the side effects from the treatment are worse than the disease). Further, a potential employee was treated less favorably in the hiring process due to failing the required pre-placement RME from a previous cancer even though it didn't impact their ability to perform the required job functions.

RECOMMENDATIONS, BENEFITS, AND IMPACTS OF REMOVING THE POLICY

Recommendations: The US Navy and Marine Corps and NNPP should continue with current radiation dose control

levels, continue to provide RMEs to radiation workers if desired, and immediately discontinue the policy of disqualifying from radiological work those who have a history of cancer, cancer therapy, radiation therapy including radiopharmaceuticals received for therapeutic purposes, or bone marrow suppression without the employee's consent. Removing the policy still maintains a robust radiation protection program.

Implementing the above recommendation provides the following benefits:

1. Permits employees with cancer to make informed choices regarding their healthcare in an occupational setting;
2. Removes the potential for liability and litigation, negative employee opinion, and negative public opinion from treating some employees less favorably than others based solely on the presence of cancer;
3. Permits employees with cancer to continue to perform their critical jobs, provide valuable mentorship, progress unhindered in their careers, and serve the Navy and Marine Corps and NNPP's important mission;
4. Aligns messaging that the assumed risk of cancer from occupational radiation exposure is small; and
5. Aligns with reasonable professional ethics standards.

The authors foresee the following impacts to implementing the above recommendation:

1. Discontinuation of the REAB process as related to disqualifying and requalifying those employees who have a history of cancer, cancer therapy, radiation therapy including radiopharmaceuticals received for therapeutic purposes,

or bone marrow suppression regardless of progression, location, etiology, or severity;

2. Discontinuation of the requirement to self-report diagnosis of cancer.
3. Medical conditions including cancer and bone marrow suppression are reviewed on a case-by-case basis as any other medical condition to determine fitness for duty and/or reasonable accommodations as appropriate;
4. Continuation of temporary local restrictions from wearing personal dosimetry or passing through a portal monitor following administration of radiopharmaceuticals for imaging or treatment; and
5. Employees with cancer remain valued members of the US Navy and Marine Corps and NNPP workforce.

CONCLUSION

In a country where equality is at the forefront of many discussions, the US Navy and Marine Corps and NNPP should align with reasonable ethical standards to support equal treatment for valuable employees with cancer rather than limiting their future employment. The restrictions placed by this policy unnecessarily prevent an otherwise qualified employee from performing radiological work and, without scientific or medical basis, do nothing to protect the employee or the organization. The policy only works to promote fear and stigma of radiation exposure, while simultaneously negatively impacting the employee's mental health and career progression, along with the organization's effectiveness. Immediate action in the cessation of this policy should be taken to avoid these negative impacts, prove to employees with cancer they are valued and will be treated equally, and reap the additional positive benefits as discussed above.

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