COMMONWEALTH OF MASSACHUSETTS
DIVISION OF ADMINISTRATIVE LAW APPEALS

October 24, 2018

Suffolk, ss.

Docket No. CR-13-249

MARYBETH SMITH, Petitioner

v.

GLOUCESTER RETIREMENT BOARD and PUBLIC EMPLOYEE RETIREMENT ADMINISTRATION COMMISSION (PERAC), Respondents

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DECISION

Appearance for Petitioner:

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Appearance for Respondent Gloucester Retirement Board

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Appearance for Respondent PERAC

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Administrative Magistrate:

Mark L. Silverstein, Esq.

Summary of Decision

The decision of a retirement board denying the application of a deceased municipal firefighter's surviving spouse for a "killed in the line of duty" death benefit pursuant to M.G.L. c. 32, § 100, without convening a medical panel to review the application, is reversed, and the matter is remanded for medical panel review.

The surviving spouse's evidence, including medical records and competent expert opinion, makes out a prima facie case supporting her claim that the firefighter died as a result of an injury sustained in the line of duty—(1) injury to his lungs as a result of directly inhaling smoke and toxic fumes while fighting a catastrophic pier fire in August 1998 for 12 ½ hours, oftentimes without access to air canisters for a self-contained breathing apparatus; (2) causing, to a reasonable degree of medical certainty, the development of an aggressive non-Hodgkin's lymphoma that was already at Stage IV and present within the firefighter's lymphatic system and part of his right lung when it became symptomatic and was detected in early 2000; (3) requiring an aggressive regimen of chemotherapy, and then, when the firefighter's lymphoma persisted, radiation treatment to arrest the disease; (4) which was temporarily successful, until the condition of metastatic cancer involving the respiratory and lymphatic systems returned in 2012, and proved fatal. PERAC's contrary conclusion, on which the board relied, was that the firefighter died as a result of an intervening cause not related to an injury sustained in the line of duty (his radiation therapy) rather than his initial lymphoma, and that the lymphoma's causation by work-related exposure to smoke and toxic fumes during the August 1998 wharf fire cannot be stated with medical certainty. That others could reach this conclusion does not negate the sufficiency of the surviving spouse's prima facie case. It suffices to place, before a medical panel, the issue of whether the firefighter sustained an injury during the 1998 fire that directly resulted in his subsequent death from metastatic cancer, and the Board should await the panel's certificate before it decides whether to allow or deny the surviving spouse's section 100 benefits application.

Background

Petitioner Marybeth Smith, the surviving spouse of deceased Gloucester firefighter Michael E. Smith, filed an application for "killed in the line of duty" benefits pursuant to M.G.L. c. 32, § 100 with the Gloucester Retirement Board (the board), based upon her husband's death from metastatic lung cancer in 2012. (Exh. 3.) She claimed that firefighter Smith had sustained an injury to his lungs while fighting a large fire at the Gloucester Fishermen's Wharf over a 12 ½ hour period in August 1998, as a result of directly inhaling smoke and toxic fumes, and that this injury was the

cause of the non-Hodgkins lymphoma he had developed by early 2000 and for which he received chemotherapy and radiation treatments between May and September of that year. Although the treatment placed firefighter Smith's cancer into remission and he was able to return to work as a firefighter, his condition of metastatic cancer had returned by March 2012, this time in the lungs and lymphatic system, and he died four months later.

The board requested that the Public Employee Retirement Administration Commission (PERAC) determine whether Mrs. Smith was eligible to receive section 100 benefits based upon her husband's death from cancer, and whether PERAC would convene a single-member medical panel to determine whether Firefighter Smith sustained injuries during the 1998 Gloucester Fisherman's Wharf fire that resulted in his cancer death in 2012, as would be required to grant "killed in the line of duty" benefits pursuant to M.G.L. c. 32, § 100. (Exh. 5.) PERAC answered both questions in the negative on April 18, 2013. It concluded that firefighter's Smith's fatal metastatic lung cancer was most likely related to his earlier radiation treatment, and therefore was not the result of injuries sustained while in the performance of his duties and either responding to or returning from a fire alarm, or at the scene of a fire or any emergency, and was neither the basis for an award of section 100 benefits nor a ground for convening a medical panel to consider Mrs. Smith's section 100 benefits application. (Exh. 6.) On April 25, 2013, the Board denied her application on the ground that its further review of her application was precluded as a matter of law by PERAC's decision, although it was willing to act on an application by Mrs. Smith for accidental death benefits under

G.L. c. 32, §§ 9 and 94B if she chose to file one. (Exh. 1.)[1]

On April 29, 2013, Mrs. Smith timely appealed PERAC's April 18, 2013 decision, and the Board's April 25, 2013 decision, pursuant to M.G.L. c. 32, § 16(4). On May 4, 2015, DALA issued a notice requiring that the parties each file a prehearing memorandum and proposed hearing exhibits in advance of the scheduled hearing.

Mrs. Smith filed a prehearing memorandum and 10 proposed hearing exhibits (Exhs. A-J) on April 25, 2015. Her proposed exhibits included two opinions—by occupational medicine specialist Dr. Jacqueline Moline (Exh. D, dated October 26, 2000), who examined firefighter Smith in early October 2000, and by environmental and occupational epidemiologist Anne L. Golden, Ph.D. (Exh. E, dated August 3, 2000)—that firefighter Smith's non-Hodgkin's lymphoma was causally related to his inhalation of smoke and toxic fumes while he fought the August 1998 Gloucester Fisherman's Wharf fire. She filed an eleventh proposed exhibit (a photo of firefighter Smith and his three sons) at the hearing (Exh. K.)

The Board filed a prehearing memorandum and 23 proposed hearing exhibits (Exhs. 1-23) on July 14, 2015. Among the Board's proposed exhibits was an opinion dated June 14, 2000 by oncologist Dr. Jonathan Friedberg, who oversaw the administration of chemotherapy to firefighter Smith beginning in May 2000. Dr. Friedberg opined that there was "no clear evidence that brief

[1]/ PERAC's April 29, 2013 did not include a statement of appeal rights and was not copied to Mrs. Smith. Board counsel advised Mrs. Smith's counsel of PERAC's determination in his April 25, 2013 letter, which included a copy of PERAC's April 18, 2013 determination. As a result, Mrs. Smith's time to appeal pursuant to M.G.L. c. 32, § 16(4) ran from the date on which she received Board counsel's April 25, 2018 letter, and her appeal on April 29, 2018 was timely.

inhalation exposures to even toxic substances would lead to [firefighter Smith's non-Hodgkins lymphoma] diagnosis," and that "no clear etiology . . . [had] been defined for the disease." (Exh. 11: Letter, Dr. Jonathan Friedberg to Attorney Joseph G. Sandulli, dated Jun.14, 2000.)[2]

I held a hearing at the Division of Administrative Law Appeals in Boston on July 29, 2015, which I recorded digitally. With the parties' agreement, I admitted all of the proposed exhibits into evidence. Mrs. Smith and the Gloucester Retirement Board presented opening arguments. Mrs. Smith testified in her own behalf. Neither the Gloucester Retirement Board nor PERAC presented witness testimony. Following Mrs. Smith's testimony, which closed the evidentiary record, counsel for Mrs. Smith and the Board presented closing arguments.

The Board had the hearing recording transcribed (by certified court transcriber Buchanan Ewing, of Cambridge Transcriptions), and filed the certified transcription on October 15, 2015. The Board filed a post-hearing memorandum on October 15, 2015, and Mrs. Smith filed a post-hearing memorandum on October 21, 2015.

Mrs. Smith's post-hearing memorandum included an opinion by Dr. Jed Pollack, a specialist in therapeutic radiology, which was undated but was stamped "received" on October 15, 2015 by Mrs. Smith's counsel's office, to the effect that the lung cancer firefighter Smith developed in 2012 was directly related to his earlier non-Hodgkin's lymphoma. Mrs. Smith offered this opinion as an additional hearing exhibit. The Board objected to this proposed exhibit, on November 2, 2015,

[2]/ PERAC did not file a prehearing memorandum or proposed exhibits, and relied, instead, upon the Gloucester Retirement Board's arguments and submissions in this matter. (*See* Letter from PERAC's Deputy General Counsel dated July 13, 2015).

because it was offered after the evidentiary record had closed, Mrs. Smith had not moved to re-open the record, and Dr. Pollack's opinion was neither newly-discovered evidence that would justify reopening the record nor "medical literature" related to cancer causation. I sustain the objection on these grounds. In doing so, I emphasize that the parties had relied upon opinions from 2000 as to whether firefighter Smith's non-Hodgkin's lymphoma was causally related to his lung injury as a result of smoke and toxic fumes exposure during the August 1998 Gloucester Fisherman's Wharf fire, and that none of them had filed an updated or more contemporary opinion before the hearing ended. The report is also superfluous; the evidence already admitted suffices to makes out a prima facie case for Mrs. Smith, and shows that her section 100 "killed in the line of duty" benefits application should be reviewed by a medical panel. Dr. Pollack's report is therefore marked as Exhibit L for identification only, and I neither rely upon it nor give it any weight in deciding this appeal. As a result, there are a total of 34 exhibits in evidence (Exhs. A-K and 1-23)and one exhibit marked for identification (Exh. L.)

Findings of Fact

1. Petitioner Marybeth (Morissey) Smith (Mrs. Smith) is the surviving spouse of Michael E. Smith, to whom she was married from May 1997 until his death on July 7, 2012. The Smiths have three sons, now aged 19, 14 and 10. (Smith direct testimony; Smith Mem. at 1, para. 1; Exh. G: Death Certificate.)

2. Michael E. Smith was employed by the City of Gloucester Fire Department as a firefighter beginning November 7, 1994, at age 25, following a pre-employment physical

examination that included a chest x-ray with two views (AP and lateral) and an electrocardiogram. The pre-employment physical included an examination of Mr. Smith's ears, nose and sinuses, throat, eyes, lymph nodes, thyroid gland and chest. All of these examined areas were "within normal limits." (Exh. 7: "Employment Exam Report of Findings," dated Nov. 4, 1994.) Based upon the examining physician's report, Mr. Smith was cleared for work as a firefighter without job assignment restrictions. (*Id.*) Mr. Smith served as a Gloucester firefighter until he died on July 7, 2012, at age 43.

3. Respondent Gloucester Retirement Board administers the Gloucester Contributory Retirement System, one of the Commonwealth's public pension systems. As a paid Gloucester Fire Department firefighter, firefighter Smith was a member of the Gloucester Contributory Retirement System.

4. Respondent PERAC is responsible, under M.G.L. c. 32, for insuring that the Commonwealth's public pension systems are administered efficiently. *See* M.G.L. c. 7, §§ 49, 50.

5. Prior to his firefighter employment, Michael Smith worked as a housepainter, working primarily on the exterior of buildings. (Exh. 11: Letter, Dr. Jacqueline Moline to Attorney Joseph G. Sandulli dated Oct. 26, 2000). He had smoked occasionally, approximately ten packs a year, until he ceased smoking completely in 1994. (Testimony of Mrs. Smith on cross-examination; Exh. 11: notes of Dr. Scott J. Swanson dated May 8, 2000, discussed below at Finding 13.) He is described by the medical notes and reports in the record as having been in good health until he began experiencing pain on the right side of his chest and coughing in early April 2000, close to his thirtieth birthday (*see, e.g.,* Exh. 11: Notes of Dr. Robert D. Tufts, dated Apr. 14, 2000.) Other than

the November 1994 report of his pre-employment physical examination including a chest x-ray, the record is without any evidence that firefighter Smith underwent any medical procedures or testing, or that he was hospitalized or treated by any physicians or by allied medical personnel, before April 2000.

6. On August 16, 1998, the Gloucester Fire Department responded to and fought an extensive fire at Gloucester's Fisherman's Wharf, located at 37 Rogers Street. Firefighter Smith was among the Gloucester Fire Department firefighters who fought this fire, and he did so for 12½ hours, from 2:30 p.m. on August 16, 1998 to 3:00 p.m. on August 17, 1998. (Exh. A: Gloucester Fire Department, "Employee's First Report of Injury or Exposure" filed by Michael E. Smith, dated Aug. 19, 1998.)

7. Among the materials that burned during this extensive fire were creosote-soaked timbers, gasoline, propane, and plastic fishing nets . Firefighter Smith was exposed to smoke and toxic fumes from this combustion during his 12 ½ hours on duty fighting this fire. There were several times when he had no spare breathable air tanks for a self-contained breathing apparatus (SCBA) because they were not available or accessible, and as a result he inhaled smoke and toxic fumes directly. (Exh. A; *see also* Exh. D: Report of Dr. Jacqueline Moline, dated October 26, 2000, following her interview and examination of Mr. Smith.)

8. Firefighter Smith reported his inhalation of smoke and toxic fumes during the fire to the Gloucester Fire Department on August 19, 1998. In his report, firefighter Smith described his resulting injury as having been to his lungs, and he described it with the code "571." According to a listing of sustained injury or illness codes included with firefighter Smith's report, "571" was the

code for an injury to the upper respiratory system. (Exh. A.)

9. On April 14, 2000, when he was 30 years old, firefighter Smith saw Dr. Robert D. Tufts at Beverly Hospital in Beverly, Massachusetts. He reported having had pain on the right side of his chest and downward for two weeks, as well as having had a nagging cough during the five preceding days that had caused chest pain and had brought up some red "chunks" earlier on the day of the office visit. Dr. Tufts reviewed a chest x-ray with two views, taken at the hospital on the same day, that showed "a fairly-dense infiltrate on the right side and what appear[ed]to be the anterior segment of the right upper lobe." The doctor's notes for this visit identified the patient as an employee of the Gloucester Fire Department but did not mention the August 1998 Fishermen's Wharf fire or any other particular event. Dr. Tufts's initial impression was "community acquired pneumonia," for which he prescribed antibiotics, and he directed firefighter Smith to return in five days for a further x-ray and reassessment. (Exh. 11: Dr. Tufts's report and Beverly Hospital Radiology Report, both dated April 14, 2000.)

10. Firefighter Smith returned to Beverly Hospital on April 19, 2000 for a chest x-ray to further explore the right side infiltrate seen in the earlier x-ray Dr. Tufts had reviewed. Dr. Augustus P. O'Keefe, the radiologist who reviewed the April 19, 2000 x-ray, noted "infiltrate on the right, primarily involving the anterior segment of the right upper lobe" and thought that there was "probably some involvement of the medial segment of the right middle lobe also." He reported the infiltrate as being "somewhat lobulated in appearance, with rounded margins inferiorly and laterally" that was overlying the hilum on the PA view." Dr. O'Keefe also noted that he saw on the x-ray no definite hilar mass or adenopathy." His impression was "pulmonary infiltrate on the right" that most

likely represents pneumonia," but Dr. O'Keefe also noted that "[i]t has some unusual characteristics" and was "partially mass-like in appearance," with "no significant interval resolution," leading him to recommend evaluation by CT scan. (Exh. 11: Beverly Hospital Radiology Report of April 19, 2000 examination.)

11. Dr. Tufts ordered that Firefighter Smith have a chest CT scan with contrast, which was performed at Beverly Hospital on April 27, 2000. The CT scan showed a large 6.0 x 5.0 cm soft tissue mass in the medial aspect of the right upper lobe (of the right lung), consistent with lymphoma. It also showed a 3.2 cm anterior mediastinal mass that had a central low attenuation, which was compatible with a nodal mass.[3] There were several other areas of diminished attenuation at the central aspect of this soft tissue area that were "suspicious for tissue necrosis." Radiologist Dr. Christian P. Ecker, who prepared the report of this examination, opined that "[t]he primary diagnostic consideration is for lymphoma." (Exh. 11: Report of chest CT scan performed on April 27, 2000.)

12. Dr. Tufts discussed the chest CT scan with Dr. Ecker and met with firefighter Smith on April 28, 2000 to review the CT scan results. His report described "changes that could be consistent with lymphoma," based upon the "fairly large right upper lobe mass with some hilar

[3]/ The mediastinum is "the central compartment of the thoracic cavity surrounded by loose connective tissue," located between the lungs. It includes the heart, esophagus, trachea and lymph nodes, and the great vessels including the ascending aorta, and the right and left pulmonary arteries. The lungs are not part of the mediastinum, but disease occurring in the mediastinum, including non-Hodgkin's lymphoma, may affect the lungs—for example, larger masses in the mediastinum may cause respiratory insufficiency, or a tumor in the mediastinum may spread to the lungs. *See* https://www.verywellhealth.com/mediastinum-definition- anatomy-and-conditions-2249125 .

adenopathy," with other areas of the chest CT scan that suggested "central necrosis."[4] Dr. Tufts's clinical impression was "lymphoma, perhaps Hodgkin's Disease" that was "treatable and potentially curable" rather than primary lung carcinoma, in view of Mr. Smith's age, cigarette smoking in the distant past, and no other occupational or industrial exposure other than those he had as a firefighter. In order to obtain a pathologic diagnosis and determine what stage of disease was present, Dr. Tufts arranged for Mr. Smith to be seen by a chest surgeon preparatory to the performance of a mediastinoscopy.[5] (Exh. 11: Beverly Hospital Radiology Report of April 27, 2000 examination; Dr. Tufts's Report dated April 28, 2000.)

13. The mediastinoscopy and, as well, a bronchoscopy, both performed at Beverly

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[4]/ The location of the hilar adenopathy to which Dr. Tufts referred in his report was clearly the hilum in the lungs. This is "the wedge-shaped area on the central portion of each lung, located on the medial (middle) aspect of each lung," and "is where the bronchi, the arteries, veins, and nerves enter and exit the lungs." Eldridge, L., *Hilum Anatomy and Abnormalities* (rev. Mar. 5, 2018), https:// www. verywellhealth.com/ what-is-the-hilum-of-the-lung-2249110.

[5]/ The mediastinoscopy and bronchoscopy were the next steps in better visualizing what the chest x-rays and CT scan appeared to show, in terms of a lymphoma, but not definitively. *Hilum Anatomy and Abnormalities* (*see* n. 4) explains this helpfully:

> On a chest x-ray, the hilar region reveals a shadow which consists of the combination of lymph nodes, the pulmonary arteries, and the pulmonary veins. Due to the overlap of these structures, it can sometimes be difficult to detect enlargement of these lymph nodes or the presence of a mass in this region. This is one of the reasons why ordinary chest x-rays can miss lung cancer.
>
> Imaging tests such as CT scans (especially with contrast) can lead to better visualization of these structures.
>
> Sometimes, further testing such as a PET scan, bronchoscopy with endobronchial ultrasound, or mediastinoscopy may be needed to better visualize the region or to obtain a biopsy sample.

Hospital, proved to be "nondiagnostic" (*i.e.*, diagnostically indeterminate) and Mr. Smith was advised to undergo a needle biopsy. Mr. Smith saw thoracic surgeon Dr. Scott J. Swanson at Brigham & Women's Hospital in Boston for a second opinion on May 1, 2000. By that time, Mr. Smith was experiencing some difficulty breathing at night, a sensation of right chest congestion and discomfort, a ten pound weight loss over the previous 3-4 weeks, and a cough with blood-tinged sputum. Dr. Swanson' report stated that Mr. Smith was a fireman and a painter and had been exposed to smoke, chemicals and paint fumes, and that he had smoked approximately ten packs of cigarettes per year until he quit in 1994. Noting that the CT scan had shown a large mediastinal mass extending into the chest, Dr. Swanson recommended a right interior mediastinotomy and biopsy to determine the diagnosis definitively. (Exh. 11: Dr. Swanson's notes, and his letter to Dr. Neil D. Kobrosky (Dr. Tufts's colleague), both dated May 8, 2000.)

14. Mr. Smith agreed to proceed as Dr. Swanson had recommended. He underwent an anterior mediastinotomy at Brigham & Women's Hospital in Boston on May 9, 2000. A pathology report regarding Mr. Smith's mediastinal mass biopsy was prepared by Dr. David Dorfman on the same day. His report noted, among other things, that "[a]pproximately 30-40% of the large cells are positive for the proliferation marker Ki-67 (MIB-1)."[6]

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[6]/ Ki-67 is a protein antigen found in the cell nucleus, and is present in all proliferating cells during the active part of the cell cycle, such as the division of cell nucleus chromosomes into two identical sets of chromosomes (mitosis). It has been used by pathology and research laboratories since the 1990s to evaluate lymphoma specimens—more precisely, to classify lymphomas including diffuse large B-cell lymphoma, to differentiate "very aggressive" lymphomas from "aggressive" or "indolent" ones, to predict survival rates for patients with each of those types of lymphomas, and to select the appropriate therapeutic approach—for example, the use of chemotherapy to treat aggressive diffuse large B-cell lymphomas, and which chemotherapy to use, such as the "CHOP" chemotherapy regimen that was given to Mr. Smith (*see* Finding 16 below). For these reasons, Ki-67 is considered to be a

15. Dr. Dorfman's diagnosis, based upon the biopsy analysis, was "[i]nvolvement by Non-Hodgkins lymphoma, diffuse, large-cell type, B cell phenotype."[7] Dr. Swanson concurred with this diagnosis. (Exh. 11: Dr. Dorfman's pathology report, dated May 9, 2000; Dr. Swanson's report to Dr. Kobrosky, dated May 15, 2000.)

16. Oncologist Dr. Jonathan Friedberg, then at Dana Farber Cancer Institute in Boston, met with Mr. Smith on May 19, 2015 and described the course of treatment for his non-Hodgkin's mediastinal large B cell lymphoma which would be six cycles of "CHOP" chemotherapy (at that point, without radiation therapy), to be reevaluated after three cycles, and the expectation that with this treatment he had a greater than 50 percent chance of long-term disease-free survival.[8] Dr.

"prognostic marker" or "predictive marker" in evaluating a lymphoma. *See* A. Broyde et al., *Role and Prognostic Significance of Ki-67 Index in Non-Hodgkin's Lymphoma*, 84 AMERICAN JOURNAL of HEMATOLOGY 338-43 (2009), http://onlinelibrary.wiley.com/doi/10.1002/ajh.21406/abstract (abstract of article and hyperlink to pdf version of full article).

[7]/ Diffuse large B-cell lymphoma (DLBCL):

> is a cancer of B cells, a type of white blood cell responsible for producing antibodies. It is the most common type of non-Hodgkin lymphoma among adults . . . with an annual incidence of 7–8 cases per 100,000 people per year. This cancer occurs primarily in older individuals, with a median age of diagnosis at approximately 70 years of age . . . though it can also occur in children and young adults in rare cases . . . DLBCL is an aggressive tumor which can arise in virtually any part of the body . . . and the first sign of this illness is typically the observation of a rapidly growing mass, sometimes associated with fever, weight loss, and night sweats . . . The most typical symptom at the time of diagnosis is a mass that is rapidly enlarging and located in a part of the body with multiple lymph nodes.

https://en.wikipedia.org/wiki/Diffuse_large_B-cell_lymphoma (parenthetical references omitted).

[8]/ "CHOP" or "R-CHOP" chemotherapy—standard therapy for diffuse large B-cell lymphoma in 2000 (and today, with some exceptions)—is:

> a combination of one monoclonal antibody, 3 chemotherapy drugs, and one steroid:

Friedberg's report to Dr. Scott Swanson stated that Mr. Smith had reported "low-grade fevers and sweats at night" over the prior week," along with weight loss and recent energy loss. Dr. Friedberg described Mr. Smith's pathology workup as "consistent with diffuse large cell B lymphoma," with "30 to 40% of the large cells . . . positive for Ki-67, suggesting a fairly aggressive malignancy." He characterized Mr. Smith's prognosis as "fairly favorable . . . given the absence of high risk factors including pleural effusion,[9] pericardial effusion, or elevated LDH." He also stated, however, that:

> [o]f some concern is the evidence of minimal chest wall invasion as well as parynchymal lung invasion, which certainly does increase his risk to some degree. In addition, he is beginning to have B symptoms, and the high MIB fraction in the biopsy does suggest a very aggressive histology.

(Exh. 11: Dr. Freidberg's Report to "Scott" (Dr. Scott J. Swanson, dated May 19, 2000.)

17. On May 22, 2000, Firefighter Smith underwent a final Gallium scan as part of his staging for chemotherapy. Planar images completed several days after administration of Gallium-67 citrate tracer confirmed (based upon Gallium uptake) a neoplastic (cancerous) disease above the diaphragm and possibly in, or extending toward, the hilum (referring to the central portion of each

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> rituximab (Rituxan), cyclophosphamide (Cytoxan), doxorubicin (Hydroxydaunorubicin), vincristine (Oncovin), and prednisone.[35] Chemotherapy is administered intravenously and is most effective when it is administered multiple times over a period of months (e.g. every 3 weeks, over 6 to 8 cycles). The number of cycles of chemotherapy given depends on the stage of the disease. Patients with limited stage disease receive 3 cycles of therapy, while patients with extensive disease 6 or 8 cycles of chemotherapy. In the United States, 6 cycles is the preferred approach rather than 8 cycles. A new development is obtaining a PET scan after completing two cycles of chemotherapy, to help make further decisions after chemotherapy.

https://en.wikipedia.org/wiki/Diffuse_large_B-cell_lymphoma.

[9]/ Excess fluid buildup around the lungs.

lung). (Exh. 11: May 22, 2000 radiology reports.)

18. On May 24, 2000, firefighter Smith saw Dr. Friedberg regarding the CHOP chemotherapy he would begin that day, the first cycle of which would consist of Cytoxin 750 mg/m2, Adriamycin 50 mg/m2, Vincristine 1.4, and Prednisone 100mg by mouth, for five days. He would be given a prescription for anti-nausea medications, and had started taking alloprurinol (to reduce uric acid levels that could increase as a result of chemotherapy). Dr. Friedberg discussed the side-effects of CHOP chemotherapy with firefighter Smith and his wife, both of whom signed an informed consent for this treatment. Dr. Friedberg noted his impression that firefighter Smith's lymphoma was likely at stage IV "based on high suspicion of parenchymal lung involvement from his mass."[10] He also noted that because there did not appear to be "a bulk of disease below the diaphragm," this "would make consolidative radiation therapy possible" for firefighter Smith "should he require it." Dr. Friedberg planned on proceeding with a second cycle of chemotherapy in three weeks. (Exh. 11: Dr. Friedberg's notes dated May 24, 2000.)

19. On June 23, 2000, Dr. Friedberg advised Attorney Joseph G. Sandulli, who represented firefighter Smith at the time, that Mr. Smith was undergoing chemotherapy with an estimated duration of 20 weeks and was not able to perform his usual firefighter duties, and, as well,

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[10]/ "Parenchymal" refers to the area surrounding the lung sacs. It appears to have been understood by the 1990s that lymphoma involved the lung more frequently in recurrent or secondary non-Hodgkin's lymphoma or Hodgkin disease than in the early stages of those diseases, and that lymphoma involving the lung parenchyma had a wide variety of radiologic appearances, including appearance on CT scans as a mass or mass-like consolidation. *See, e.g.*, Lewis, E.R., Caskey, C.R., and Fishman, E.K., *Lymphoma of the Lungs: CT Findings in 31 Patients*, 156 AMERICAN J. OF ROENTGENOLOGY 711-14 (Apr. 1991), available online at: https://www.ajronline.org/doi/ 10.2214/ ajr.156.4.2003430 (brings up abstract of journal article; click on "PDF" button to open full version).

that this might be followed by radiation therapy, leading Dr. Friedberg to estimate the duration of firefighter Smith's disability as six months. (Exh. 11: Letter, Dr. Jonathan Friedberg to Attorney Joseph Sandulli, dated Jun. 23, 2000.)

Opinion of Treating Oncologist Dr. Jonathan Friedberg (June 14, 2000)

20. In early June 2000, Attorney Sandulli sought an opinion from Dr. Friedberg as to whether Mr. Smith's non-Hodgkin's lymphoma was related to the smoke and toxic fumes he inhaled during the August 1998 Gloucester Fisherman's Wharf fire. In his June 14, 2000 response, Dr. Friedman stated that based upon his experience with lymphoma, there was "no clear evidence that brief inhalation exposures to even toxic substances would lead to this [lymphoma] diagnosis." Dr. Friedberg also stated that the incidence of non-Hodgkin's lymphoma was increasing [in] the United States in all patients," and that "no clear etiology that has been defined" for the disease. (Exh. 11: Letter, Dr. Jonathan Friedberg to Attorney Joseph G. Sandulli, dated Jun.14, 2000.)[11]

Opinion of Environmental/Occupational Epidemiologist Anne L. Golden (August 4, 2000)

21. Attorney Sandulli also sought an opinion regarding the relationship between firefighter Smith's non-Hodgkin's lymphoma and his employment as Gloucester firefighter from environmental and occupational epidemiologist Anne L. Golden, Ph.D.[12] Dr. Golden was, at that

[11]/ Attorney Sandulli's letter requesting this opinion is not in the record. I have characterized the nature of his request based upon Dr. Friedberg's response.

[12]/ This request for an opinion is also not in the record.

time, an assistant professor at Mount Sinai School of Medicine in New York City, in its Department of Community and Preventive Medicine.[13] In her written response to Attorney Sandulli, dated August 4, 2000 (Exh. E), she stated her opinion that "Mr. Smith's work as a firefighter, and the chemical carcinogenic exposures he has experienced, in particular benzene and 1,3-butadiene, are consistent with an increased risk of developing non-Hodgkin's lymphoma." (Exh. E at 3.)

22. Dr. Golden identified firefighter health and safety as having been her major research focus. Her research work included "studies to determine the magnitude and causes of excess cancer risk among firefighters" conducted in collaboration with the United Firefighters Association and the United Fire Officers Association in New York City. (Exh. E. at 1.) Dr. Golden authored a review paper on this topic[14] and a report on occupational cancer among New York City firefighters.[15] (*Id*.) She identified the area of environmental/occupational epidemiology in which she specialized as "determining the impact that chemical and other types of exposures have on the health or workers." (*Id*.)

23. Dr. Golden's opinion that firefighter Smith's exposure to chemical carcinogens as a firefighter, in particular benzene and 1,3-butadiene, was consistent with an increased risk of developing non-Hodgkin's lymphoma was based upon her experience as an environmental and

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[13]/ Dr. Golden is currently an Assistant Clinical Professor of| Environmental Medicine & Public Health at the Icahn School of Medicine at Mt. Sinai in New York.

[14]/ Golden, A.L. , Markowitz, S.B and Landrigan, P.J., *The Risk of Cancer in Firefighters*, 10 OCCUPATIONAL MEDICINE: STATE OF THE ART REVIEWS 803-820 (1995).

[15]/ Landrigan, P.J., Golden, A.L. and Markowitz, S.B., *Occupational Cancer in New York City Firefighters* (no journal or book cited) (United Firefighters Association and United Fire Officers Association, New York, 1994).

occupational epidemiologist, her studies, her review of the applicable literature on firefighter exposure to carcinogens, and Mr. Smith's occupational and clinical history, and, more specifically, upon both the general exposure of firefighters to chemical carcinogens and the nature and extent of Mr. Smith's specific exposure to them. In general, Dr. Golden explained, firefighters were exposed to known human carcinogens at structural and vehicle fires that included benzene, 1,3 butadiene, polycyclic aromatic hydrocarbons (a byproduct of creosote combustion and the combustion of many other organic materials), formaldehyde, styrene, polychlorinated biphenyls and asbestos, in concentrations considered to be hazardous, and that this exposure was "firmly established in the occupational medicine literature," of which she gave several examples. (Exh. G at 2.)[16] She described two of these carcinogens encountered during firefighting, benzene and 1.3 butadiene, as "known to increase the risk of developing leukemia and non-Hodgkin's lymphoma." (*Id.*)[17] Turning to firefighter Smith and his exposure to known human carcinogens specifically, Dr. Golden described him as having been employed as a City of Gloucester Fire Department firefighter since November 1994, and as having been in good health, with no history of medical problems, before he developed non-Hodgkin's lymphoma. She described his firefighting work as having "routinely

[16]/ Dr. Golden cited the following medical journal articles as examples of studies that "measured levels of chemical carcinogens at structural and vehicle fires at concentrations that are considered hazardous and well in excess of permissible workplace levels": Brandt-Rauf, P.W. *et al.*, *Health Hazards of Firefighting: Exposure Assessment*, 45 BRITISH J. OF INDUSTRIAL MEDICINE 606-12 (1985); Jankovic, J., Jones, W., Burkhart J. and Noonan, G., *Environmental Study of Firefighters*, 35 ANNALS OF OCCUPATIONAL HYGIENE 581-602; and Treitman, R.D., Burgess, W.A. and Gold, A., *Air Contaminants Encountered by Fire Fighters*, 41AMERICAN INDUSTRIAL HYGIENE J. 796-802 (1980). (Exh. G at 2.)

[17]/ In support of this statement, Dr. Golden cited Monson, R.R., and Fine, L.J., *Cancer Mortality and Morbidity Among Rubber Workers*, 61 J. OF THE NATIONAL CANCER INSTITUTE 1047-53, and Young, N., *Benzene and Lymphoma*, 15 AMERICAN J. OF INDUSTRIAL MEDICINE 495-98 (1989).

exposed [him] to the complex mixture of chemical substances contained in the fire smoke, smoldering debris, and hazardous materials spills that are encountered in firefighting." (*Id.*) Dr. Golden noted in particular firefighter Smith's involvement in fighting a fire at the Gloucester Fishermen's Wharf on August 16-17, 1998, during which "a large quantity of plastic fishing nets, as well as creosote-soaked timbers, burned for many hours." According to Dr. Golden, "[t]he hazardous conditions ordinarily encountered by a firefighter at a fire scene of this nature apparently were exacerbated for Mr. Smith by the lack of an available self-contained positive pressure breathing apparatus (SCBA) for several periods of time while he was working," and "[o]n multiple occasions during the fire, he operated without an SCBA, and directly inhaled the smoke and fumes." She noted that firefighter Smith had reported his respiratory exposure by inhalation to smoke and toxic fumes during the fire to the Gloucester Fire Department. (Exh. G at 3; firefighter Smith's report is discussed above at Finding 8.) Based upon her experience as an environmental and occupational epidemiologist, her studies, her review of the applicable literature on firefighter exposure to carcinogens, and Mr. Smith's occupational and clinical history, it was Dr. Golden's opinion that "Mr. Smith's work as a firefighter, and the chemical carcinogenic exposures he has experienced, in particular, benzene and 1,3 butadiene, are consistent with an increased risk of developing non-Hodgkin's lymphoma." (Exh. 11: letter, Anne L. Golden, Ph.D. to Joseph G. Sandulli, Esq., dated Aug. 3, 2000.)

Completion of CHOP Chemotherapy and Assessment of Persisting Mediastinal Disease

24. Firefighter Smith completed six cycles of CHOP chemotherapy by September 15,

2000. Although the chemotherapy had mediated his tumor and its metastasis to a significant extent, his cancer had not been eradicated fully. A post-CHOP chest CT scan performed on October 2, 2000 showed a new 2.4 x 2 cm lesion in the right anterior mid lung, and a Gallium scan performed on October 5, 2000 showed "trace persistence of mediastinal disease" in the anterior mediastinum. Radiation oncologist Dr. Peter Mauch at Brigham and Women's Hospital in Boston assessed the chemotherapy as having been effective nevertheless and, in view of what the scans suggested, he recommended "a course of consolidative radiation therapy to the mediastinum to reduce the likelihood of local recurrence," to begin within a week, "without more aggressive chemotherapy at this time." (Exh. 11: Notes of Dr. Peter Mauch dated Oct. 5, 2000.)

Opinion of Dr. Jacqueline Moline (October 2000)

25. Attorney Sandulli also sought an opinion as to whether Mr. Smith's work as a Gloucester Fire Department firefighter was causally related to his development of non-Hodgkin's lymphoma from Dr. Jacqueline Moline at the Mount Sinai Hospital in New York. Dr. Moline was board certified in internal and occupational medicine. Preparatory to preparing an opinion, she reviewed firefighter Smith's medical records and his incident report to the Gloucester Fire Department regarding the 1998 Fisherman's Wharf fire. Dr. Moline examined firefighter Smith on October 10, 2000 and interviewed him regarding his work as a firefighter, focusing upon his participation in fighting the Gloucester Fishermen's Wharf fire, the absence of sufficient air masks at times during that event and, as a result, his direct exposure to, and inhalation of, smoke and fumes from burning creosote, gasoline, propane, and plastics, including nets. (Exh. D: Letter, Dr.

Jacqueline Moline to Attorney Sandulli dated Oct. 26, 2000.)

26. It was Dr. Moline's opinion, which she stated to "a reasonable degree of medical certainty," that Michael Smith's "occupation as a firefighter was a substantial contributing cause to the development" of his non-Hodgkin's lymphoma," based upon "the history of exposure to carcinogens in the line of duty, the clinical history and the pathological diagnosis," (*Id*. at 2.) Dr. Moline cited, specifically, the history she obtained from firefighter Smith regarding his work as a housepainter and then as a firefighter, the 1998 Gloucester Fisherman's Wharf fire (including the absence of sufficient air masks, and his inhalation of smoke), and his non-Hodgkin's lymphoma diagnosis in May 2000. Her report summarized this history, firefighter Smith's chemotherapy, and the subsequent recommendation that he receive radiation treatment because of his tumor's persistence. Her opinion was also based upon "the many medical studies in the medical literature which have found an increased risk of lymphoma in firefighters," and that had associated non-Hodgkin's lymphoma "with exposure to benzene and 1,3 butadiene, two compounds commonly encountered at fires, especially when plastics and gasoline are present," referring to the papers Dr. Golden had cited. Dr. Moline stated that "[b]y all descriptions of the fire at Fisherman's Wharf, it is virtually certain that Mr. Smith was exposed to these chemicals in the course of fighting that fire." (*Id*. at 1.)

27. It was also Dr. Moline's opinion that "[u]nfortunately, Mr. Smith's prognosis is fair, as non-Hodgkin's lymphoma is notoriously difficult to cure." (Exh. D at 2.)

28. After receiving a copy of Dr. Moline's opinion, the Gloucester Fire Department placed firefighter Smith on "injury on duty" status, pursuant to M.G.L. c. 41, § 111F. (*See* Exh. 5:

Board counsel's request to PERAC as to Mrs. Smith's eligibility to receive section 100 "killed in the line of duty" benefits and whether a medical panel would be convened, dated Feb. 11, 2013). This allowed firefighter Smith to be on leave while he recuperated from his radiation treatments without loss of pay.[18]

29. Firefighter Smith saw Dr. Friedberg on February 5, 2001, approximately 12 weeks after he had completed radiation therapy. He complained of intermittent chest discomfort that was "unpredictable and brief in duration," and a severe cough in the morning. Dr. Friedberg's report for this visit states that Mr. Smith denied having fevers or sweats, had gained some weight, and that an improvement in his energy level following radiation had "levelled off," but that he had been "able to do some work painting approximately 30 hours per week." Dr. Friedberg performed a physical examination, and upon palpation, he noted no lymphadenopathy in the cervical, supraclavicular or axillary lymph node chains bilaterally. He also noted no lung or heart issues, and no abdominal masses. However, a chest CT scan that Dr. Friedberg ordered showed a "fullness in the area of the right upper lobe" that appeared to be "mildly increased from 2.9 cm to 3.4 cm in diameter," and that "consolidation of this area appears a bit worse, as compared with his preradiation scan," which, Dr. Friedberg noted, led to a "differential diagnosis [that] would include infection, radiation damage, or

[18]/ M.G.L. c. 41, § 111F, first para. provides in pertinent part that:

> Whenever a police officer or fire fighter of a city, town, or fire or water district is incapacitated for duty because of injury sustained in the performance of his duty without fault of his own, or a police officer or fire fighter assigned to special duty by his superior officer, whether or not he is paid for such special duty by the city or town, is so incapacitated because of injuries so sustained, he shall be granted leave without loss of pay for the period of such incapacity . . . .

recurrent disease." He characterized this finding on the CT scan as "rather unusual," and his impression was that it "does not look classic for radiation penumonitis, although some of these features may be representative." Dr. Friedberg noted that firefighter Smith was scheduled for a gallium scan in two weeks, "and if this is avid, I think we have to be quite worried about the potential for recurrent disease." (Exh. 12: Dr. Friedberg's notes regarding Feb. 5, 2001 visit.)

30. The gallium scan performed on February 23, 2001 revealed no gallium-avid disease in the anterior mediastinum. Dr. Friedberg's impression was, as a result, that "Mr. Smith remains clinically and radiographically in remission after consolidation radiation therapy for non-Hodgkin's lymphoma." He planned to see firefighter Smith again in three months and perform another CT and gallium scan. Dr. Friedberg also thought it "will be important to monitor his lung capacity prior to his return to work as a full-time firefighter." (Exh. 12: Dr. Friedberg's notes regarding Feb. 23, 2001 visit).[19]

31. Also on February 23, 2001, Dr. Patrick W. Linson, a resident at Dana-Farber Cancer

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[19]/ "Remission," in the cancer context, refers to the abatement of active manifestations of the disease that leaves it manageable, which is not the same as curing it. The National Institutes of Health's National Cancer Institute defines remission, thus, as:

> A decrease in or disappearance of signs and symptoms of cancer. In partial remission, some, but not all, signs and symptoms of cancer have disappeared. In complete remission, all signs and symptoms of cancer have disappeared, although cancer still may be in the body.

https://www.cancer.gov/publications/dictionaries/cancer-terms/def/remission. That firefighter Smith's treating physicians followed him regularly after his radiation treatments ended in late 2000 for signs of recurrent disease underscores that (1) his remission was not a cure; and (2) while his symptoms of cancer may have disappeared for a time, it might have remained in his body, and therefore the firefighter needed to be followed regularly in order to manage his condition of cancer.

Institute, wrote to the Gloucester Fire Department Chief to advise that firefighter Smith's "life threatening condition" of cancer that had "required aggressive medical treatments, including radiation therapy and chemotherapy," was in remission and that, with a workout regiment to rebuild his strength that was already underway, the firefighter would likely be ready to return to work in early May 2001. Dr. Linson also advised the fire chief that firefighter Smith's "lung function and risk for pulmonary toxicity put him in a position where we would hope you could assign him to duties which would limit his exposure to these agents." (Exh. 12: Letter, Dr. Patrick Linson to Fire Chief Barry McKay dated Feb, 23, 2001.)

32. A chest CT scan performed on May 24, 2001 at Brigham and Women's Hospital showed an irregular increased density area in the superior segment of firefighter Smith's right lower (lung) lobe that appeared "somewhat different in configuration" than it did on the February 5, 2001 CT scan, and "almost mass-like," which, to the radiologists who examined the scan, was "worrisome for lymphoma involvement." (Exh. 12: radiology report of chest scan, May 14, 2001.) A gallium scan performed on May 17, 2001 revealed "a focus of mild asymmetric increased uptake in the right hilar region" (meaning the hilar region in the central portion of the lungs; see n. 4 above)," which required further evaluation via SPECT imaging.[20] This showed "mild increased bihilar uptake which is most likely post-treatment related," and there were no other definite gallium uptake concentrations that suggested recurrent disease in the neck, mediastinum, chest or axillae. (Exh. 12: radiology

[20]/ SPECT (single-photon emission computed tomography) is a tomographic imaging technique using a gamma camera to view the distribution of a radionuclide, and this view is then converted by computer to a 3-D data set, which can be manipulated to show thin "slices" along any chosen body axis. *See* https://en.wikipedia.org/wiki/ Single-photon_emission_ computed_ tomography.

reports regarding gallium scan injection and emission tomography performed May 17, 2001.)

33. Dr. Friedberg reviewed the May 17, 2001 radiology reports and saw firefighter Smith on the same day. He noted that Mr. Smith was "painting full time and looking forward to returning to the fire station this weekend" (meaning May 19 or 20, 2001). His impression was that firefighter Smith showed no evidence of recurrent lymphoma, and remained in remission six months following the completion of radiation therapy. In view of the area of "increased consolidation . . . within the radiology field," his plan was to re-image the same area with a CT scan and perform a gallium scan within three months "to insure this does not represent relapse." (Exh. 12: Dr. Friedberg's notes regarding May 17, 2001 visit).

34. Firefighter Smith returned to work in mid to late May 2001. A chest CT scan performed on August 27, 2001 showed that his right paramediastinal mass was stable, and a gallium scan and SPECT imaging performed on August 30, 2001 showed a slightly reduced mediastinal mass and no evidence of disease recurrence. (Exh. 12: radiology reports of procedures on Aug. 27 and 30, 2001). Dr. Mauch examined firefighter Smith on August 30, 2001, found no lymphadenopathy, and noted that Mr. Smith appeared to be in remission. (Exh. 12: note of Dr. Peter Mauch dated Aug. 30, 2001.)

35. Followup outpatient visits to Dana Farber Cancer Institute on October 4, 2001 and December 13, 2001 showed that firefighter Smith's cancer remission continued, that he reported using a cannister filter mask as a firefighter and while painting, and that he had breathing problems related to a reactive airways disease that were being managed with the use of an Albuterol inhaler. (Exh. 12: notes of Dr. Anthony F. Massaro regarding Oct 4, 2001 and Dec. 13, 2001 visits.)

36. Between in 2002 and 2005, firefighter Smith had followup Gallium and CT scans, and was followed post-treatment by Dr. Friedberg, Dr. Mauch, and Dr. Lawrence N. Shulman at Dana Farber Cancer Institute. They found no worsening of his mediastinal mass during that time, no evidence of recurrent disease, no evidence of avid lymphoma above or below the diaphragm, and continued remission from lymphoma. (Exhs. R13 (2002 medical records), R14 (2003 medical records), R15 (2004 medical records) and R16 (2005 medical records). Dr. Mauch's impression on March 14, 2003 was that although recent gallium scans showed minimally increased gallium uptake in firefighter Smith's parotid glands, this did not suggest recurrent lymphoma, and he wrote that "clinically and radiologically, he appears to be in a complete clinical remission," and was scheduled for followup visits and testing every six months afterward. (Exh. 14: Dr. Mauch's notes of Mar. 2, 2003 visit.) On January 1, 2005, firefighter Smith presented at Beverly Hospital's Northeast Hospital Acute Care Facility with a complaint of left-sided chest pain for one week, the origin or cause of which could not be determined despite a physical examination, electrocardiogram and chest CT scan. The scans showed no hilar lymphadenopathy or mediastinal mass in the lung area, and an area of increased density bordering the superior mediastinum that was determined to be compatible with post-radiation fibrosis adjacent to the superior mediastinum's right side. (Exh. 16: records dated January 16 and 17, 2005.)

37. On April 16, 2006, firefighter Smith presented at Beverly Hospital's Northeast Hospital Acute Care Facility with a complaint of having inhaled smoke while fighting a large fire, during which he had to move quickly, leaping fences and picking up debris, without a respirator. He felt nauseous and was short of breath, and during some heavy lifting afterward, he developed an

ache in the left side of his chest that felt like a muscle pull he had sustained before when he was lifting weights. A chest x-ray showed "a little bit of perihilar scarring," and x-ray report stated that the "superior mediastinal changes on the right may be associated with old radiation therapy and/or surgical intervention." The chest wall pain was reproduceable by depressing on the costal sternal margin in the area of the fourth rib, and firefighter Smith was also able to reproduce the pain by flexing his pectoralis muscles. The shortness of breath with which he presented, and a sinus tachycardia rate of 120, resolved before he was discharged. The impression was a muscle strain. (Exh. 17: emergency visit report by Dr. Michael K. Tibbles dated Apr. 16, 2006, and radiology report dated Apr. 16, 2006.)

38. On April 18, 2006, firefighter Smith filed an injury report regarding the April 16, 2006 fire with the Gloucester Fire Department. He reported that he "took heavy smoke at March/Garage Fire and injured chest muscle performing fire fighting duties." He recorded two codes (310, for "Sprains. strains," and 571, for "Upper respiratory") on his injury report. (Exh. 8: Fire Department injury report filed by firefighter Smith, dated Apr. 18, 2006.)

39. Several months later, Dr. Shulman saw firefighter Smith for a followup of his mediastinal lymphoma and post-treatment status, and found no obvious evidence of the lymphoma. (Exh. 17: Dr. Shulman's notes of Oct. 19, 2006.)

40. On January 18, 2007, firefighter Smith saw primary care physician Dr. James Whynot at Addison Gilbert Primary Care in Gloucester (an affiliate of Beverly Hospital) complaining that his shortness of breath had worsened even with his use of an Albuterol inhaler at the then-current dose. He had also been taking twenty 500 mg. Vicodin tablets per month to relieve arthritis pain in

his shoulders and knees. Dr. Whynot prescribed a lesser amount of Vicodin and instructed firefighter Smith to have an orthopedic evaluation regarding his knee and shoulder pain. He assessed the firefighter's breathing problem as the result of lung disease (fibrosis) secondary to his prior radiation treatment for non-Hodgkin's lymphoma, and increased his inhaler dosage to see if this would improve his breathing. (Exh. 18: Dr. Whynot's notes of Jan. 18, 2007 visit.)

41. Firefighter Smith returned to Addison Gilbert Primary Care on March 26, 2007, complaining of pain in the shoulders and in his right-side chest wall, and requesting vicodin. The nurse practitioner who saw him instructed him to use the vicodin he still had, and that a decision on whether to renew the Vicodin prescription had to await Dr. Whynot's return. (Exh. 18: Notes of Kim Graham, N.P. regarding Mar. 26, 2007 visit.) Firefighter Smith saw Dr. Victor Carabba at Addison Gilbert Primary Care three days later, on March 30, 2007, regarding his shoulder and knee pain. Dr. Carabba recorded that he saw "no alternative at the time but to use narcotic Rx," and and therefore wrote a refill prescription for a 30-day supply of Vicodin 500 mg., with any further prescriptions to be followed by Dr. Whynot. (Exh. 18: Notes of Dr. Carabba for Mar. 30, 2007 visit.) During a followup visit with Dr. Whynot on June 6, 2007, firefighter Smith reported "a weakness in the center of his chest" with a burning sensation, a lump in his throat, and feeling a fullness while lying down. Dr. Whynot assessed the chest discomfort as a "new problem" with an unclear etiology, and ordered a chest x-ray to rule out a recurrent tumor and a BaSw (upper gastrointestinal chest radiography with barium-based contrast material) to determine whether there was a stricture in the esophagus. (Exh. 18: Notes of Dr. Whynot for Jun. 6, 2007 visit.)

42. On December 15, 2007, firefighter Smith reported to the Gloucester Fire Department

that he was caught in smoke without a self-contained breathing apparatus (SCBA) when the wind changed or swirled, exposing him to smoke and asbestos. (Exh. 8: Workers' Compensation Status Report: description of accident dated Dec. 15, 2007.)[21]

43. On July 9, 2008, firefighter Smith, then 39 years old, saw Dr. Whynot with a complaint that he "could not breathe and was short of breath at times," and that "when the fire bell goes off he gets startled and has chest pain with radiation to the left arm." A chest CT scan performed on July 11, 2008 showed no evidence of pulmonary mass density or suspicious nodular changes, no hilar or mediastinal adenopathy, and no evidence of hepatic or bone lesions. (Exh. 19: Dr. Whynot's notes of Jul. 9, 2008 visit, and imaging report of chest x-ray taken Jul. 11, 2008.) During a followup visit on July 28, 2008, Dr. Whynot discussed with firefighter Smith the extensive right upper lobe scarring and lung volume loss (retraction) shown by the chest CT scan, his symptoms of burning in the chest, and his shortness of breath on exertion, and his concern that Mr. Smith was "exposed to smoke and chemicals at fires and that this will not improve his lung function and in fact will deteriorate it," and also that the firefighter was "a candidate for early coronary heart dsease" as a result of the prior radiation treatment. (Exh. 19: Dr. Whynot's notes of Jul. 28, 2008 visit.)

44. Firefighter Smith had a right shoulder arthrosocopy labral repair to repair a tear in that shoulder on December 23, 2008. The repair site healed well as of January 9, 2009, and he was scheduled to receive physical therapy. (Exh. 20: Orthopedics note, Brigham and Women's Hospital,

[21]/ The accident report itself is not in the record.

Jan. 9, 2009.) He saw Dr. Whynot later that month, who noted that firefighter Smith was still working as a painter and firefighter, and that he was taking oxycodone for pain related to the shoulder as well as Vicodin for his other pain. Dr. Whynot instructed the firefighter that he would continue with Vicodin, but that other doctors had to call his office before prescribing other narcotics. (Exh. 20: Dr. Whynot's notes for Jan. 19, 2008 visit.)

45. Firefighter Smith complained of chest pain during his September 2, 2010 and December 22, 2010 followup visits with Dr. Carabba at Addison Gilbert Primary Care . He was still taking Vicodin for pain, but the dosage had been increased (as of May 27, 2010, due to the firefighter's continuing chest pain) to 750 mg, and he was using two inhalers (ProAir HFA 108 and AERS, an albuterol sulfate inhaler). Dr. Carabba's impression was that the continuing chest discomfort was related to his prior radiation treatment. ((Exh. 21: Dr. Carabba's notes for May 27, 2010, Sept. 2, 2010 and Dec. 22, 2010 visits.)

46. Firefighter Smith reported continuing chest pain to Dr. Carabba during followup visits in early 2011. It was noted as "episodic severe" on March 10, 2011. Left-sided rib pain for several days was also noted during the April 27, 2011visit, which prompted a chest CT, but this showed no changes in the mediastinum when compared with firefighter Smith's July 11, 2008 chest CT, and no rib fractures or evidence of acute cardiopulmonary disease were seen. On July 6, 2011, firefighter Smith reported that he had been playing ball with his children and was running when he felt a muscle pull in his left chest wall, and that when he began a stone wall installation project he developed pain in his left forearm and hear a "pop" in his chest. He told Dr. Carabba that he did not feel he could work safely as a firefighter due to the pain and weakness he was feeling. Dr. Carabba's impression

was that the left-sided rib pain was "[p]rob[ably] due to scar tissue." Firefighter Smith continued working and experiencing chest pain. Dr. Carabba reported during his December 14, 2011 followup visit that he "remains quite active as a firefighter/ambulance driver" and was aware he should not be taking pain medication at work or while driving, but that he felt the medication was not controlling his chest pain. He also reported that Firefighter Smith also told him that he had fallen at work six weeks before this office visit (in October 2011); Dr. Carabba's notes for the December 30, 2011 followup visit added that the fall occurred while fighting a house fire, when he noticed that his oxygen was low and he tripped over something in the dark when he turned to leave the house. Firefighter Smith complained of right shoulder pain, right ankle and back pain, and joint pain. A chest x-ray showed no abnormalities of the right scapula, and "increased opacity was noted in the medial right lung, abutting the mediastinum, grossly stable from before." (Exh. 22: Dr. Carabba's notes of visits throughout 2011.)

47. In January 2012, firefighter Smith saw Dr. Carabba with complaints of right shoulder and ankle pain (on January 5 and 26, 2012), and a "small swelling" in the right groin (on January 31, 2012), as to which the doctor note "Question of Lymphadenopathy." As of February 8, 2012, the small groin density had increased in size, to that of a golfball, and had become red and painful, and firefighter Smith felt feverish, with chills. (Exh. 23: Dr. Carabba's notes for Jan. 5, 26 and 31, 2012.)

48. On February 8, 2012, Mr. Smith saw Dr. Carabba regarding right groin pain and the increase in size of the small density in the right groin area, which was red and painful, as well as fever and chills and "changing suspicious lesions." An ultrasound performed on February 9, 2012

was "extremely limited," but Dr. Ecker, who reviewed the test results, concluded that there was an "upper right thigh lymphadenopathy with dominant 3.5-cm lymph node" with a "nodal architeture suggesting large benign reactive lymph node." (Exh. 23: Cr. Carraba's note. Feb. 8, 2012; Imaging report prepared by Dr. Ecker, Feb. 9, 2012.)

49. Firefighter Smith saw Dr. Shulman at Dana Farber Cancer Institute on February 19 and 21, 2012 for evaluation of his right inner thigh mass. Dr. Shulman's notes for the February 19, 2012 visit noted "no hepatomegaly or palpable abdominal masses," and that firefighter Smith "[c]linically looks well without obvious evidence of lymphoma," although he also noted that "[m]uch of his blood work is pending." Two days later, he noted that the etiology of the upper right thigh mass was "unclear . . . [i]t could be malignant, or could represent infection." (Exh. 23: Dr. Shulman's notes, Feb. 19 and 21, 2012.)

50. An incisional biopsy of the right inguinal mass was performed at Brigham's and Women's Hospital on February 22, 2012. The pathologic diagnosis of the samples of abnormal-appearing tissue removed during the biopsy was a "metastatic poorly differentiated adenscarcinoma with hepatoid feature sand extensive necrosis." Pathologist Dr. Lynette M. Sholl, who made the diagnosis, noted that the findings were not specific as to any particular type of cancer, and that "[h]epatoid feature can be seen in several different tumor types." Based upon the staining profile of the lesional cells, particularly a "strong CK7 expression," Dr. Sholl noted that "possible primary sites include lung, upper GI tract, and pancreaticobiliary tract," and that "[c]orrelation with clinical and radiological findings is needed." (Exh. 23: operative report dated Feb. 22, 2012; pathology report dated Feb. 22, 2012.)

51. A positron emission tomography scan (PET-CT) performed at Dana-Farber Cancer Institute on March 2, 2012 at Dr. Shulman's request showed a "significant increase in paramediastinal consilidation in the right lung" compared to what was viewed in a 2003 CT scan, but the radiology report also noted thay "within this area there are several more solid appearing areas with relatively intense multifocal FDG uptake,[22] significantly greater than what is expected with chronic postradiation changes extending from the right apex to the superior segment of the right lower lobe." Other areas of intense FDG uptake were also noted, including in inguinal lymph nodes within the right side of the area of abdomen and pelvis, in the proximal ascending colon, and within the right shoulder blade area, and there was also mild FDG uptake in several soft tissue nodules along the right chest wall. The impression of the radiologists who prepared the report was that "[o]verall the findings are concerning for widespread metastatic disease." (Exh. 23: Brigham & Women's Hospital radiology report dated Mar. 2, 2012.)

52. Dr. David Jackman, an oncologist at Dana Farber Cancer Institute, saw firefighter Smith on March 6, 2012, and reviewed the firefighter's medical history, including the recent PET-CT and pathology reports. His assessment was metastatic lung adenocarcinoma and bony metastases in the right ankle, right shoulder and left hip. He informed firefighter Smith and his wife that he could not be cured of his metastatic stage IV lung cancer, and that the objective of treatment,

[22]/ Fluordeoxyglucose (FDG) is used in performing PET-CT scans to detect medically-active malignant lesions, including lung cancer and lymphoma, and distinguish them from areas that do not take up FDG as intensively as the areas of suspected malignant lesions. *See* Cedars-Sinai Medical Center, online description of FDG-PET scan and its purpose, https://www.cedars-sinai.edu/Patients/ Programs-and-Services/Imaging-Center/For-Patients/Exams-by-Procedure/Nuclear-Medicine/FDG-PET-Scan.aspx .

including chemotherapy, would be to control the cancer's growth for as long as possible and improve the quality of his life, including with the use of palliative radiation to treat the disease noted in multiple bones. (Exh. 23: Dr. Jackman's notes dated Mar. 6, 2012.)

53. In her consultation note of the same date, radiation oncologist Dr. Elizabeth A. Baldini oppined that the mass in the upper lung lobe was "most likely radiation associated." (Exh. 23: consultation report of Dr. Elizabeth A. Baldini dated Mar. 6, 2012.)

54. On March 9, 2012, Dr. Shulman signed a "to whom it may concern" letter stating that Firefighter Smith was a patient at Dana-Farber Cancer Institute, and was being treated for "metastatic lung cancer, most likely related to the radiation therapy which he received for his lymphoma treatment in 2000," and that he would be out of work for at least the next several months while he was undergoing treatment. (Exh. 23: letter by Dr. Shulman, dated Mar. 9, 2012.)

55. Chemotherapy produced a "mixed response" as of early May 2012. It did not arrest firefighter Smith's cancer, and he experienced adverse affects from the chemotherapy, including appetite loss, weight loss and fatigue. His pain increased. Palliative radiation to the right shoulder, left hip and right ankle produced some improvement in his symptoms, but there were several areas of disease progression. The goal became living as long as possible for the sake of his children, but the prognosis was poor. (Exh. 23: Thoracic oncology followup report dated May 14, 2012.)

56. Mr. Smith died on July 7, 2012. The death certificate gave the cause of death as metastatic lung cancer, and the approximate time between onset and death as one year. (Exhibit R4.)

57. Mrs. Smith applied to the Gloucester Retirement Board for "killed in the line of duty" death benefits pursuant to M.G.L. c. 32, § 100. (Exh. 3.)

58. On February 11, 2013, the Board requested that the Public Employee Retirement Administration Commission (PERAC) determine whether Mrs. Smith was eligible to receive section 100 benefits based upon her husband's death from cancer. It also asked whether PERAC would convene a single-member medical panel to determine whether Firefighter Smith sustained injuries during the 1998 Gloucester Fisherman's Wharf fire that resulted in his cancer death in 2012, as would be required for an award of section 100 benefits. (Exh. 5.)

59. On April 18, 2013, PERAC answered both questions in the negative, but noted that the death benefits application should be considered under M.G.L. §§ 9 and 94B (in other words, as an application for accidental disability retirement benefits) and that it would convene a medical panel to consider benefits eligibility under those sections. (Exh. 6.)

60. On April 25, 2013, the Gloucester Retirement Board denied further action on Mrs. Smith's section 100 benefits application as precluded by PERAC's denial. (Exh. 1.)

61. Ms. Smith filed a timely appeal challenging the denial of her section 100 benefits application with the Contributory Retirement Appeal Board on April 29, 2013.

Discussion

1. M.G.L. c. 32, § 100 "Killed in the Line of Duty" Benefit, Evidence Needed to Obtain It, and Burden of Proof

a. Section 100 benefit

M.G.L. c. 32 makes available two types of "killed in the line of duty" benefits. One of them, made available by M.G.L. c. 32, § 100A, is a one-time award of $150,000 payable to the surviving

spouse of a public safety employee, "who, while in the performance of his duties and as a result of incident, accident or violence, was killed or sustained injuries which were the direct and proximate cause of his death." Eligibility for this one-time benefit is not at issue here. The other "killed in the line of duty" benefit, made available by M.G.L. c. 32, § 100, is a full pension payable to the surviving spouse of a firefighter, police officer or corrections officer killed in the performance of his duties, which is what Mrs. Smith seeks.

The relevant subparagraph of section 100, first para. related to firefighters killed in the line of duty, provides in pertinent part that:

> if a firefighter while in the performance of his duties and as the result of an accident while responding to or returning from an alarm of fire or any emergency, or as the result of an accident involving a fire department vehicle, which the firefighter is operating or in which he is riding, or while at the scene of a fire or any emergency is killed or sustains injuries which result in his death . . . there shall be paid to the surviving spouse of such firefighter . . . an annual amount of pension which shall be equal to the amount of salary which would have been paid to such firefighter . . . .

Per its plain language, section 100 specifies:

> three situations in which the circumstances of the death of a firefighter give rise to the widow's eligibility for a pension equal to the full amount of the salary of the firefighter. Under clauses [1] and [2] the death or injuries leading to death must be as a result of an accident while the firefighter is engaged in specific activities, but under clause [3] it is sufficient if the firefighter dies or suffers injuries resulting in death "while at the scene of a fire or any emergency."

Norfolk Retirement Bd. v. Contributory Retirement Appeal Bd., 15 Mass. App. Ct. 683, 685, 448 N.E.2d 75, 77 (1983)(surviving spouse of fire lieutenant who died as the result of a heart attack he sustained while in the performance of his duties at the scene of an emergency during which he administered first aid to a choking infant was eligible to receive a section 100 "widow's pension"

under the statute's third clause, which does not require that death while in the performance of duties be the result of an accident).

Mrs. Smith seeks this benefit. It would be equal to 100 percent of the pension firefighter Smith would have been paid "had he continued in service in the position held by him at the time of his death," based upon "the maximum salary set for the position whether or not [he] had reached the maximum at the time of his death." M.G.L. c. 32, § 100, first para. This would be substantially higher than an accidental death benefit paid pursuant to M.G.L. c. 32, § 9.

b. Evidence of entitlement to the section 100 benefit

To show that she was entitled to receive a "killed in the line of duty" benefit under M.G.L. c. 32, § 100, Mrs. Smith needed to show, by a preponderance of the evidence, that (1) her husband suffered the injury she alleges—an injury to his lungs as a result of inhaling smoke and toxic fumes, including known human carcinogens, while fighting the August 1998 Gloucester Fisherman's Wharf fire—while in the performance of his duties as a City of Gloucester firefighter, and "while at the scene of a fire or any emergency;" and (3) the injury resulted directly in his death from metastatic lung cancer nearly 14 years later, in 2012. The burden of proof as to these elements of section 100 benefits eligibility is on Mrs. Smith, as the benefits applicant.

i. Injury sustained "in the line of duty . . . while at the scene of a fire or other emergency"

The injury alleged by a section 100 benefits applicant to have killed her firefighter spouse must have been sustained in the line of duty, and in one of the circumstances that the statute

identifies—either one of the types of accidents described in clauses 1 and 2 of the statute's first paragraph, neither of which applies here, or the scenario described in clause 3—if the firefighter dies or suffers injuries resulting in death "while at the scene of a fire or any emergency," which Mrs. Smith asserts here. To prove eligibility under clause 3, the evidence must show that the firefighter had been at the scene of a fire or other emergency, while in the performance of his duties, when he suffered the injury, and that the injury was suffered (meaning that it began) while he was at that scene. See *Pacheco v. Contributory Retirement Appeal Bd.*, C.A. No. 95-5541A, Memorandum of Decision (Mass. (Suffolk) Super. Ct., Sept. 15, 1997).[23]

[23]/ In *Pacheco*, a fire lieutenant's surviving spouse sought M.G.L. c. 32, § 100 benefits based upon her husband's death from a heart attack shortly after he responded to a fire call box alarm, searched for but found no fire, and returned to the firehouse, complaining of chest pains on the way back. Upon returning to the firehouse, the lieutenant did not feel well, had a fellow firefighter call an ambulance, and was transported to a hospital, but within an hour after arriving he died of a myocardial infarction. The retirement board denied section 100 benefits without first having a medical panel convened. Both DALA and the Contributory Retirement Appeal Board affirmed the denial, despite a written opinion by a physician specializing in internal medicine that the lieutenant had underlying artheriosclerotic coronary artery disease and that "with medical certainty" his myocardial infarction began when he complained about chest pains on the way back to the fire station, and that "the extreme stress engendered by the fire alarm . . . superimposed on an underlying substrate of pathology, caused [the lieutenant's] myocardial infarction, cardiac arrest, and death." The issue on appeal of the benefits denial to the Superior Court was whether the circumstances presented showed that the lieutenant was "at the scene of a fire or other emergency" when he sustained injuries that allegedly resulted in his death." The court held that a firefighter's death from a heart attack shortly after responding to a false fire alarm would qualify as "death as the result of an injury sustained while at the scene of a fire or other emergency," one of the three circumstances identified by section 100, even though no fire was found, but only if the firefighter's heart attack had begun at the fire alarm response scene. Because the record included no medical evidence of when the lieutenant's heart attack began, the court held that the denial of section 100 benefits lacked supporting substantial evidence. For the same reason, the court was unable to decide whether the lieutenant had sustained injuries "while at the scene of a fire or other emergency" that resulted in his death, and so could not award benefits. It remanded the surviving spouse's section 100 benefits application for consideration of such medical evidence as the parties chose to submit on this point, but it did not require medical panel review.

ii. *Inapplicability of statutory "cancer presumptions"*

Section 100 provides that the "cancer presumptions" recited by M.G.L. c. 32, §§ 94A and 94B "shall not be applicable to the death of any firefighter, police officer or corrections officer for which a pension is provided under this section."[24] M.G.L. c. 32, § 100, fifth para. Section 100A includes a similar provision. *See* M.G.L. c. 32, § 100A(e). Under both statutes, therefore, a surviving spouse applying for "killed in the line of duty" benefits must prove eligibility for it without the benefit of a presumption that the death-causing injury was suffered by the firefighter (or other public safety officer listed by the statute) in the line of duty. *See Towler v. Contributory Retirement*

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[24]/ M.G.L. c. 32, § 94A provides in pertinent part that:

> any condition of impairment of health caused by any disease of the lungs or respiratory tract, resulting in total disability or death to a uniformed member of a paid fire department . . . shall, if he successfully passed a physical examination on entry into such service or subsequent to such entry, which examination failed to reveal any evidence of such condition, be presumed to have been suffered in the line of duty, as a result of the inhalation of noxious fumes or poisonous gases, unless the contrary be shown by competent evidence.

M.G.L. c. 32, § 94B provides in pertinent part that:

> any condition of cancer affecting the skin or the central nervous, lymphatic, digestive, hematalogical, urinary, skeletal, oral or prostate systems, lung or respiratory tract, resulting in total disability or death to a uniformed member of a paid fire department . . . shall, if he successfully passed a physical examination on entry into such service or subsequent to such entry, which examination failed to reveal any evidence of such condition, be presumed to have been suffered in the line of duty, unless it is shown by a preponderance of the evidence that non-service connected risk factors or non-service connected accidents or hazards undergone, or any combination thereof, caused such incapacity. The provisions of this section shall only apply if the disabling or fatal condition is a type of cancer which may, in general, result from exposure to heat, radiation, or a known or suspected carcinogen as determined by the International Agency for Research on Cancer, so called.

Appeal Bd., 37 Mass. App. Ct. 277, 279-80, 639 N.E.2d 394, 396 (1994). Here, in addition to having to prove that the injury alleged to have caused firefighter Smith's death was sustained in the line of duty and while responding to a fire or other emergency, Mrs. Smith must prove that the injury caused his death, as there is no applicable presumption that such was the case.

iii. Direct causation of death by alleged injury

The standard of proof needed to show eligibility for "killed in the line of duty" benefits under M.G.L. c. 32, § 100 or § 100A is significantly higher than what is needed to show eligibility for accidental death benefits under M.G.L. c. 32, § 9. This difference was discussed recently in the section 100A context. *Paré-Doherty v. State Bd. of Retirement*, Docket No. CR-17-829, Decision (Mass. Div. of Admin. Law App., May 25, 2018). *Pare-Doherty* noted that an injury caused by a workplace accident may qualify for an accidental death benefit under section 9 if the surviving spouse shows that the death of the firefighter (or other listed public safety officer) was the "natural and proximate result" of a personal injury sustained in the performance of his duties; under section 100A, however, the death of a firefighter (or other listed public safety officer) will not qualify his surviving spouse for a death-in-the-line-of- duty benefit unless it was brought about directly by the workplace accident in question. *Id.*; Decision at 6-7. Section 100A requires a showing, in other words, that the injury suffered in the line of duty was the proximate cause of the death. Death brought about by an intervening cause does not qualify for "killed in the line of duty" benefits under M.G.L. c. 32, §100A. Absent any language to the contrary in the statute, section 100 requires the same showing of direct causation.

Neither statute defines "proximate cause" or "intervening cause," and no definition of either term appears at M.G.L. c. 32, § 1. Both terms are well-known in civil practice, however. There is a substantial body of caselaw defining them, particularly in the context of actions seeking recovery for injuries or death alleged to have been caused by tortious conduct.

Proximate cause is "that which in a continuous sequence, unbroken by any new cause, produces an event and without which the event would not have occurred. It may be assisted or accelerated by other incidental and ancillary matters, but, if it continues as an operative and potent factor, the chain of causation is not broken." *Wallace v. Ludwig*, 292 Mass. 251, 254, 198 N.E.159, 161 (1935); *see also Lynn Gas & Electric Co. v. Meriden Fire Insurance Co.*, 158 Mass. 570, 575, 33 N. E. 690, 691 (1893) (defining "direct and proximate cause" as "[t]he active efficient cause that sets in motion a train of events which brings about a result without the intervention of any force started and working actively from a new and independent source"). DALA decisions have adopted one or both of these definitions of proximate cause in appeals from the denial of accidental death benefits under M.G.L. c. 32, § 9, *see, e.g., Reed v. Teachers Retirement Bd.*, Docket No. CR-04-010, Decision on Second Remand at 15 (Mass. Div. of Admin. Law App., Dec. 31, 1997)(following the *Wallace* definition of proximate cause), and, more recently in an appeal from the denial of section 100A "killed in the line of duty" benefits, *Fletcher v. State Bd. of Retirement*, Docket No. CR-14-246, Decision at 7 (Mass. Div. of Admin. Law App., Jun. 1, 2018)(following the *Wallace* and *Lynn Gas* definitions).

"Intervening cause" is something that breaks the uninterrupted chain of events required to show that a particular injury was the direct cause of an injury or death. A more formal definition in

the context of death-related civil actions and criminal prosecutions is "an independent supervening cause of death." *See, e.g.*, *Commonwealth v. Golston*, 373 Mass. 249, 257, 366 N.E.2d 744, 750 (1977). However it is defined, an intervening cause of death supervenes causation by the original injury. Whether it did is case-specific, and so "intervening cause" is often defined by example, both in the caselaw and in expressions of conventional legal wisdom, such as one that occurred during this case. The Board postulated a "classic" example of an intervening cause—an injured person being transported to a hospital for treatment due to injuries he sustained dies en route as the result of an auto accident involving the ambulance. The accident in this hypothetical scenario is an intervening cause because, among other things, its occurrence had nothing to do with the injury the patient suffered, the treatment he was to be given, or the expected prognosis for recovery following treatment. The example assumes that the patient was alive when the auto accident occurred, and would have likely survived the original injury but for the accident.

Although the example is instructive, it is simplistic to a fault, as it suggests that almost anything that can be labeled an "intervening act" nullifies causation by the original injury. Not every intervening act is an instrument that displaces the original injury as the proximate cause of resulting death, however. *Wallace* explained that "the intervening act of a third person may not break the causal connection between the original negligence of the defendant and the ultimate injury to the plaintiff," and that "the primary cause may be the proximate cause, provided it continues to be efficiently, actively and potently operative, although successive subsidiary instrumentalities may cooperate to produce the final result." 292 Mass. at 255, 198 N.E. at 161. *Wallace* went on to explain what happens when death or injury is the result of a true intervening cause rather than the

outcome of the original causative act or instrument—"the causal connection between the original wrong of a defendant resulting in injury to a plaintiff and the ultimate harm to such plaintiff has been broken and . . . something so distinct from the original injury has thereafter happened as to constitute an intervening efficient, independent and dominant cause." *Id*.; 292 Mass. at 255, 198 N.E. at 161-62.

I follow this functional definition of intervening cause here in determining whether Mrs. Smith has presented evidence sufficient to show that the lung injury from smoke and toxic fume inhalation firefighter Smith sustained in the line of duty while fighting the 1998 Gloucester Fisherman's Wharf fire was the proximate cause of his death from metastatic lung cancer in 2012, or whether the radiation treatment he received for his non-Hodgkin's lymphoma in 2000 was the intervening cause of death.

Section 100 does not state what proof is needed to show proximate, or direct, causation of death. The overall requirement is that the proof be sufficient to make out a prima facie case as to causation. Proving a prima facie case requires "evidence that, until its effect is overcome by other evidence, compels the conclusion that the evidence is true," *Burns v. Commonwealth*, 430 Mass. 444, 720 N.E.2d 798, 804 (1999), and shifts the burden of producing contradictory evidence to the other side, whether at trial or upon a dispositive motion such as a motion for summary decision (or summary judgment in the courts). *See, e.g.*, *Ford Motor Co. v. Barrett*, 403 Mass. 240, 526 N.E.2d 1284, 1286-87 (1988). This evidence must "show causation by a probability or by 'more than the possibility or chance' of the existence of a causal connection." *Doherty v. Boston Retirement Bd*., Docket No. CR-99-591, Decision at 7 (Mass. Div. of Admin. Law App., Sept. 22, 2000), *quoting*

Robinson v. Contributory Retirement Appeal Bd., 20 Mass. App. Ct. 634, 482 N.E.2d 514, 519 (1985).[25]

General language about proof of a prima facie case and burdens of proof is of limited value in defining what evidence suffices under section 100 to make out a prima facie case as to causation, because the answer is case-specific, and what suffices depends upon the injury alleged to have been the direct cause of death in the line of duty and the intervening cause asserted (if any). There are unique circumstances present here that have no analogue in prior "killed in the line of duty" benefit decisions, most of which involved heart attack-related deaths that followed firefighting. *See, e.g., Mingolelli v. Boston Retirement Bd*., Docket No. CR-00-018, Decision (Mass. Contributory Retirement App. Bd., Dec. 3, 2002); *Doherty*; *Towler v. Lawrence Retirement Bd*., Docket No. CR-90-083, Decision (Mass. Div. of Admin. Law App., Aug. 15, 1991). The unique circumstances form an asserted chain of causation, starting with the lung injury resulting from exposure to smoke present here and toxic fumes during 12½ hours of firefighting at the Gloucester Fisherman's Wharf fire, followed by its alleged causation of the firefighter's aggressive non-Hodgkin's lymphoma in 2000 and its treatment with chemotherapy and radiation that year and, following apparent remission for several years, the re-occurrence of a condition of metastasizing cancer in 2012 that proved fatal. Proof of direct causation is challenging because of the length of time between the alleged injury and death (14 years) and an alleged intervening cause of death (the radiation treatment in 2000).

[25]/ *Doherty* sustained the denial of section 100 benefits because the surviving spouse of a firefighter who, after completing a 4 p.m. to 7 a.m. shift, returned home and died suddenly in the evening, apparently of a heart condition, did not meet her burden of proving that the firefighter's death was proximately caused by an injury sustained at the scene of a fire or other emergency.

The effect, upon proof of proximate causation, of a lengthy time period between the alleged injury and death was addressed recently in the section 100A context. In *Fletcher v. State Bd. of Retirement*, Docket No. CR-14-246, Decision (Mass. Div. of Admin. Law App., Jun. 1, 2018), the surviving spouse's retired police officer husband died from cardiac arrest due to aspiration in May 2012, at the age of 92, which was related to the polio he had contracted in late 1955 while resuscitating a drowning child in response to a call he received. The child had all three strains of the disease and, shortly afterward, the officer was diagnosed with them as well. He suffered related paralysis of the larynx that caused difficulty swallowing and speaking for the rest of his life. The officer returned to work intermittently, but stopped working and his accidental disability retirement application based upon polio was approved in March 1979. The officer was diagnosed with post-polio syndrome in November 2004, which worsened his condition. His death occurred 57 years after he contracted polio, and 33 years after he retired. The retirement board granted his surviving spouse accidental death benefits pursuant to M.G.L. c. 32, § 9, but later denied the officer's daughter's application for "killed in the line of duty" benefits pursuant to M.G.L. c. 32, § 100.

The denial was reversed on appeal to DALA. First Magistrate James P. Rooney held that because section 100A does not define injury sustained while in the line of duty narrowly, the legislature recognized implicitly that a public safety employee might not have died immediately as a result of "incident, accident or violence" while in the performance of his duties, and that the resulting death sometimes occurs years later. The passage of many years between contracting polio and death from its complications did not make the connection between his death and the polio he contracted too attenuated to meet the requirements of M.G.L. c. 32, § 100A for a "killed in the line

of duty" benefit. It also did not rule out polio contracted by the policeman in the performance of his duties as the direct and proximate cause of his death. The decision noted that the officer had contracted polio before an effective vaccine was available to confer immunity, and the intervention of decades between the officer's contraction of polio and his death from its sequellae was consistent with the characteristics of the disease, and its course— "the disease had permanent consequences, often paralysis, either immediately or over time, but when it occurred the paralysis was inevitably fatal," and the progression of the officer's disease was also "consistent with the reported histories of post-polio syndrome, which typically occurs fifteen or more years after the initial polio episode." *Fletcher*; Decision at 9-10.

The decision noted that the case presented a "rare situation" in which decades had lapsed between injury and resulting death, but there was "little doubt" that the polio the officer contracted on duty "was the direct cause of his post-polio syndrome and eventual death." *Id*. at 10. *Fletcher* reversed the denial of section 100A benefits and awarded the officer's surviving spouse a "killed in the line of duty" benefit under the statute. It did not remand the matter to the retirement board to convene a medical panel, or state whether either party had requested medical panel review. However, the decision noted that a medical panel had evaluated the officer's accidental disability retirement application in 1979 and found that his disability at the time (choking spealls caused by paralysis of the throat) prevented him from fulfilling the function of a police sergeant and was the result of the polio he had contracted on the job in 1955. *Id*. at 3. In addition, the physician who was caring for the officer when he died had opined that the cardiac arrest he suffered in 2012 "was suspected to be the result of aspiration given the background of post-polio syndrome," *id*. at 4, and

that there was "little doubt that the polio he contracted on duty was the direct cause of his post-polio syndrome and eventual death." *Id*. at 10.

Fletcher's approach is followed appropriately in the section 100 context as well. An injury sustained by a firefighter while in the performance of his duties and while he was at the scene of a fire or other emergency may qualify for a "killed in the line of duty" benefit under M.G.L. c. 32, § 100 even if death occurs years later. No statutory language compels a different approach. Following this approach comports with the Superior Court's admonition in *Pacheco* to avoid a reading of section 100 that "too narrowly construes the salutary intent of the law, designed as it is, to provide an enhanced degree of support for the suriviving spouses of those who die as a result of the most intense aspects of the firefighting duties." *Pacheco v. Contributory Retirement Appeal Bd*., C.A. No. 95-5541A, Memorandum of Decision at 4 (Mass. (Suffolk) Super. Ct., Sept. 15, 1997). As a result, the fact that nearly 14 years elapsed between the injury in the line of duty alleged here (the lung injury from smoke and toxic fume inhalation that firefighter Smith sustained in the line of duty while fighting the 1998 Gloucester Fisherman's Wharf fire) and his death from cancer in 2012 does not itself make it impossible to prove that the 1998 injury was the direct cause of the firefighter's death or preclude Mrs. Smith from establishing her entitlement to "killed in the line of duty" benefits under M.G.L. c. 32, § 100.

Mrs. Smith's section 100 benefits application was denied without the benefit of medical panel review, based upon PERAC's view that the cause of firefighter Smith's death in 2012 was his prior radiation treatment, not an accident or injury he sustained in the line of duty. Section 100 does not state what must be proved for a "killed in the line of duty" benefits applicant to show entitlement

to medical panel review. Absent any statutory language or caselaw to the contrary, it is reasonable to assume that to obtain medical panel review of her section 100 benefits application, Mrs. Smith needed to make out a prima facie case with evidence that, if unrebutted and believed, would allow a factfinder to conclude that the prerequisites for section 100 benefits are met here—injury to firefighter Smith's lungs while in the performance of his duties as a City of Gloucester firefighter, and "while at the scene" of the Gloucester Fisherman's Wharf Fire in August 1998 that resulted in a condition of aggressive, metastatic cancer, and that this injury directly resulted in the firefighter's death from metastatic cancer in 2012. Proof of a prima facie case is required to obtain medical panel review in an appeal challenging the denial of an accidental disability retirement application. *See, e.g., Poirier v. New Bedford Retirement Bd*., Docket No. CR-15-503, Decision (Mass. Div. of Admin. Law App., Aug. 25, 2017) (to be entitled to a medical panel examination and review of his accidental disability retirement application, public retirement system member was required to present sufficient evidence that, if unrebutted and believed, would allow a factfinder to conclude he was entitled to accidental disability retirement as a result of total and permanent disability by reason of a personal injury sustained or hazard undergone as a result of, and while in the performance of, his job duties at some definite place and at some definite time).

Absent any language to the contrary in section 100, I apply the prima facie case requirement as the evidentiary threshold for obtaining medical panel review of an application for "killed in the line of duty" benefits pursuant to M.G.L. c. 32, § 100.

2. *Did Firefighter Smith "while in the performance of his duties," and"while at the scene of a fire or any emergency. . . sustain injuries which result[ed] in his death," per M.G.L. c. 32, § 100?*

a. "Injury sustained" "while in the performance of his duties" and "while at the scene of a fire or other emergency"

Two elements of a valid section 100 "killed in the line of duty" death benefits claim are clearly met here—the occurrence of the alleged injury (1) while firefighter Smith was in the line of duty and (2) at the scene of a "fire or other emergency." Firefighter Smith reported sustaining a lung injury as a result of inhaling smoke and toxic vapors from burning materials, including plastic nets, creosoted timbers and gasoline, when he responded to and fought the Gloucester Fisherman's Wharf fire in August 1998. (Findings 6-8.) Mrs. Smith claims that his death from metastatic cancer in 2012 was caused directly by that injury.

There is no question that firefighter Smith sustained the injury alleged here in the course of performing his duties—responding to and fighting a fire—and "while at the scene of a fire or other emergency," one of the circumstances that M.G.L. c. 32, § 100 identifies specifically. The evidence makes out a prima facie case as to these elements of a section 100 benefits claim, therefore.

b. "Which result[ed] in death"

i. The competing arguments: *proximate versus intervening causation*

Mrs. Smith contends that (1) the metastatic cancer from which her husband died in March 2012 was a recurrence of the cancer that was first diagnosed, in May 2000, as non-Hodgkins

lymphoma in the right upper lobe of his lung, for which he received chemotherapy and then radiation treatment, and that appeared, initially, to have gone into remission but proved to be aggressive over time and, despite treatment, ultimately fatal; and (2) Mr. Smith's inhalation of carcinogens while fighting an extensive fire at Gloucester's Fishermen's Wharf in August 1998, at times without access to breathable air tanks for a self-contained breathing apparatus, was the substantial contributing cause of his non-Hodgkins lymphoma in 2000 and, consequently, of his cancer's recurrence in early 2012. The medical basis for Mrs. Smith's position comprises (1) the records showing the diagnosis and treatment of her husband's non-Hodgkins lymphoma in 2000; (2) the opinion of environmental and occupational epidemiologist Anne L. Golden, on August 3, 2000, that Mr. Smith's work as a firefighter and the expected exposures to known human carcinogens that he sustained in fighting the August 1998 fire at Gloucester Fishermen's Wharf, where plastic fishing nets and creosoted timbers burned—particularly benzene and 1,3 butadiene—were consistent with an increased risk of developing non-Hodgkin's lymphoma; (3) the October 26, 2000 report of Dr. Jacqueline Moline, a board-certified occupational medicine physician and internist who examined Mr. Smith and opined, with a reasonable degree of medical certainty, that Mr. Smith's exposure to carcinogens as a firefighter was "a substantial contributing cause" of the development of this type of cancer, and that his prognosis was fair because his non-Hodgkins lymphoma was "notoriously difficult to cure;" and (4) the recurrence of Mr. Smith's cancer, in early 2012, in what proved to be a fatal, metastasizing form, which his treating physicians attributed to the radiation exposure he sustained in late 2000

when he was treated for non-Hodgkin's lymphoma.[26] Overall, it is Mrs. Smith's claim that the 1998 inhalation and exposure triggered a condition of cancer in firefighter Smith's lymph and respiratory systems that had already advanced rapidly when it was detected in early 2000 and that ultimately proved fatal in 2012, despite aggressive treatment by chemotherapy and radiation in 2000 and initially apparent success in placing the disease into remission—a medically-related course of events that underscores, rather than breaks, the chain of proximate causation of death from cancer resulting from the 1998 lung injury that firefighter Smith sustained in the line of duty.

The Board counters that Mrs. Smith's application was properly denied because the immediate cause of firefighter Smith's death in 2012 was his radiation treatment to treat his Stage IV non-Hodgkin's lymphoma in 2000, rather than the injury he sustained while performing his duties while at the scene of the 1998 Gloucester Fisherman's Wharf fire. It bases this argument on what the death certificate states as to the cause of death (metastatic lung cancer; *see* Finding 56) and upon the conclusion of firefighter Smith's treating physicians in early 2012 that his metastatic lung cancer was most likely related to the radiation therapy he received for his lymphoma treatment in 2000. (*See* Findings 53, 54.) The Board's argument is that "[e]ven if one assumes that Mr. Smith developed non-Hodgkin's lymphoma as a result of fighting the August 1998 Fisherman's Wharf fire"—a position the Board does not accept—he "did not sustain an injury at that fire that 'resulted' in his

[26]/ Ms. Smith also relied upon the "cancer presumptions" recited by M.G.L. c. 32, §§ 94A and 94B. However, M.G.L. c. 32, § 100(e) provides specifically that the section 94A and 94B presumptions do not apply to an application for section 100 "killed in the line of duty" benefits. As a result, neither presumption counts as evidence in support of her position or in making out a prima facie case as to section 100 benefits eligibility. *See* above at 39-40.

death," and the death claim in this case is "derivative," as it resulted from the radiation firefighter Smith received and not from the lung injury that allegedly caused his non-Hodgkin's lymphoma, and such a derivative claim can be recognized as the basis for an accidental death benefit under M.G.L. c. 32, § 9 but not under M.G.L. c. 32, § 100. (*See* Board's post-hearing mem. at 5-6.)

Which of these views prevails depends upon whether the evidence makes out a prima facie case that firefighter Smith's lung injury directly caused his death. Per *Burns* (*see* above at 43), the evidence must compel the conclusion (at least until its effect is overcome by other evidence) that the lung injury firefighter Smith sustained while in the line of duty responding to the August 1998 Fisherman's Wharf fire commenced a continuous sequence of events, beginning with the development of non-Hodgkin's lymphoma that was diagnosed 21 months after the fire, continuing through chemotherapy and radiation treatment in 2000 that appeared to cause the remission of this condition of cancer, and ending with the return of metastatic cancer and the firefighter's death in 2012. *See Wallace* (discussed above at 41, 42-43.) The evidence must also show, per *Wallace*, that while the radiation treatment the firefighter received in 2000 may have accelerated or assisted the return of firefighter Smith's cancer in 2012, the original injury "continued as an operative and potent factor," and the radiation treatment therefore did not break the chain of causation.

ii. Evidence that the lung injury caused the non-Hodgkin's lymphoma

The first link in this chain of causation was firefighter Smith's initial development of cancer, the aggressive Stage IV non-Hodgkin's lymphoma that was diagnosed in May 2000 and for which he was treated by chemotherapy and radiation through the end of that year. Mrs. Smith relies upon

two expert opinions linking firefighter Smith's lung injury as a result of exposure to toxic fumes including known human carcinogens during the August 1998 fire to his non-Hodgkin's lymphoma. One was the August 3, 2000 opinion of environmental and occupational epidemiologist Anne L. Golden, that Mr. Smith's work as a firefighter and the expected exposures to known human carcinogens that he sustained in fighting structural fires, such as the August 1998 fire at Gloucester Fishermen's Wharf, where plastic fishing nets and creosoted timbers burned—particularly benzene and 1,3 butadiene—were consistent with an increased risk of developing non-Hodgkin's lymphoma. (Findings 21-23.) The other was the October 26, 2000 report of Dr. Jacqueline Moline, a board-certified occupational medicine physician and internist who examined Mr. Smith on October 10, 2000 and opined, with a reasonable degree of medical certainty, that Mr. Smith's exposure to carcinogens as a firefighter was "a substantial contributing cause" of the development of this type of cancer. (Findings 25 and 26.) Both experts were competent to express these opinions, in view of their respective professions and fields of research, and their familiarity with the occupational exposures of firefighters to carcinogens, the types of carcinogens released during the combustion of materials such as those that burned during the 1998 Gloucester Fisherman's Wharf fire, and the relationship between exposure to these substances and the development of non-Hodgkin's lymphoma. Both experts identified the grounds for their opinions as to the causation of firefighter Smith's non-Hodgkin's lymphoma, including relevant medical literature that both experts recognized as authoritative[27] and, in Dr. Moline's case, an examination of firefighter Smith on October 10, 2000

[27]/ *See* Findings 23 n. 16 and 24 n. 17 as to the supporting medical literature Dr. Golden cited; and Finding 26, noting Dr. Moline's referral to the medical literature Dr. Golden cited.

after he had completed chemotherapy and was about to begin radiation treatments.

The Board asserts that these opinions are overcome by others in the record to the contrary regarding cancer causation. On June 14, 2000 Dr. Friedberg, the oncologist who managed firefighter Smith's chemotherapy and radiation treatments, opined (in response to an inquiry by firefighter Smith's attorney at the time) that, based upon his experience with lymphoma, there was "no clear evidence that brief inhalation exposures to even toxic substances would lead to this [lymphoma] diagnosis," and that the incidence of non-Hodgkin's lymphoma was increasing [in] the United States in all patients," and that "no clear etiology . . . has been defined" for the disease. (Finding 20.) The other, expressed by firefighter Smith's treating physicians in 2012, including Dr. Shulman, was that the metastatic lung cancer diagnosed at the time was most likely related to the radiation therapy which he received to treat his lymphoma treatment in 2000. (Findings 52-54.)

I do not determine which of these competing schools of thought regarding cancer causation is more medically plausible. I determine only that the opinions Mrs. Smith presented as part of her direct case were persuasive of their truth, per *Burns*, that the firefighter's lung injury sustained while fighting the 1998 Gloucester Fisherman's Wharf fire resulted in his development of an aggressive lymphoma in 2000. This evidence was not overcome by the countervailing opinions on which the Board relies.

Dr. Friedberg's opinion was based upon his own experience, rather than upon any stated familiarity with cancers developed by firefighters exposed to carcinogens, and he did not explain why he considered firefighter Smith's exposure to toxic substances over a 12½ hour period during the 1998 fire to have been "brief," if in fact that was his understanding, or whether he was aware that

the firefighter had breathed these substances directly during the fire because he had no access to oxygen canisters for a self-contained breathing apparatus. Also unclear is whether, from a medical perspective, Dr. Friedberg's "no clear etiology" opinion as to non-Hodgkin's lymphoma causation was in early 2000, or has since remained, a valid generalization with respect to a direct exposure such as firefighter Smith suffered and the aggressive lymphoma he developed afterward.

The other opinions of treating physicians, given in 2012, addressed only the metastasizing cancer diagnosed early that year, rather than any etiology for the earlier Stage IV non-Hodgkin's lymphoma diagnosed in 2000. In early 2012, firefighter Smith's treating physicians faced a metastasizing cancer that had spread to his lungs, lymphatic system and bones, and the prognosis was poor. Chemotherapy administered in May 2012 did not arrest the cancer, generated adverse effects that firefighter Smith could not tolerate, his pain increased, and the disease continued to progress. (Finding 55.) There had been concern since the 2000 chemotherapy did not eradicate the lymphoma that aggressive radiation to the mediastinum was needed to reduce the likelihood of the cancer's reoccurrence, but that there would remain a risk of infection, radiation damage or recurrent cancer in this area. (*See* Finding 29.) In the circumstances, the treating physicians' opinions as to radiation-related causation in 2012 appear to have been most likely related to diagnosing the firefighter's 2012 metastasizing cancer as incurable and determining that treatment could be no more than palliative at that point. (*See* Findings 52-54.) There is no evidence that they intended to rule out a causal relationship between the lung injury that firefighter Smith sustained while fighting the August 1998 fire, the aggressive lymphoma he developed subsequently, and the metastasizing cancer that proved fatal in 2012.

It suffices to say, at this point, that while others might opine otherwise as to causation, the Moline and Golden opinions suffice to establish, as part of Mrs. Smith's prima facie direct case, the first link of the causation chain—that the firefighter's initial condition of cancer was caused by the lung injury he sustained as a result of exposure to toxic fumes, including known human carcinogens, during the August 1998 fire. The 2012 opinions of firefighter Smith's treating physicians do not undermine this prima facie case. The issue of causation is, however, a medical one that is best placed before a medical panel in the first instance. Mrs. Smith's direct case on this point suffices to get her case to the panel.

iii. Evidence of the relationship between the initial lymphoma and the cancer that proved fatal several years following treatment

I turn next to whether the evidence suffices to make out a prima facie case as to the next link of an unbroken chain of causation here—the direct relationship of firefighter Smith's initial condition of cancer (the aggressive, metastatic non-Hodgkin's lymphoma diagnosed in May 2000) and the metastatic lung cancer that proved fatal in 2012. It does, primarily because the lymphoma was advanced and aggressive, had spread into firefighter Smith's lung, and was placed into remission by chemotherapy and radiation treatment but never left his body, and the return of metastasizing cancer, which his treating physicians feared and monitored regularly, occurred several years later, consistent with the course of this disease.

By early May 2000, it was clear that firefighter Smith had developed a cancer affecting his lymphatic system, and that the lymphoma had already infiltrated his lungs (the respiratory system,

in other words) and was particularly aggressive, and fast-developing. It was also clear that the firefighter's prognosis was, as Dr. Moline stated, "fair," as non-Hodgkin's lymphoma is "notoriously difficult to cure." (*See* Finding 27.) Absent a miracle, the medical objective for firefighter Smith and his treating team was remission—the abatement of active manifestations of his cancer, leaving it manageable, which is not the same as curing it. (*See* Finding 30 n. 19.) The therapy of choice in achieving this objective for some indeterminate period was the aggressive course of chemotherapy firefighter Smith received between May and September 2000 and, when the tumor proved persistent, the aggressive course of radiation that he received subsequently through early December 2000. These points are of critical importance in assessing the actual cause of firefighter Smith's death for M.G.L. c. 32, § 100 purposes.

The evidence shows by May 2000, firefighter Smith's non-Hodgkin's lymphoma had advanced to Stage IV, was aggressively malignant, and had spread to his lungs. The gallium scan conducted on May 22, 2000 confirmed the presence of cancerous disease above firefighter Smith's diaphragm and possibly in, or extending toward, the hilum (the central portion of each lung). (Finding 17.) Dr. Friedberg noted his impression, at the time, that firefighter Smith's lymphoma was likely at stage IV "based on high suspicion of parenchymal lung involvement from his mass." (Finding 18.) It was understood at the time that lymphoma involved the lung more frequently in recurrent or secondary non-Hodgkin's lymphoma than it did in the early stages of the disease, and that lymphoma involving the lung parenchyma "had a wide variety of radiologic appearances, including appearance on CT scans as a mass or mass-like consolidation." (Finding 18 n. 10.)

There was a guarded prognosis for remission via aggressive chemotherapy and radiation

therapy, which alone offered a path toward this outcome with an expectation, at least on Dr. Friedberg's part, that with this treatment firefighter Smith had "a greater than 50 percent chance of long-term disease-free survival." (Finding 16). As hopeful as this expectation was, it was understood, as to Stage IV non-Hodgkin's lymphoma, that the cancer would remain in the body despite chemotherapy and radiation, and could again become active and prove fatal. (*See* Finding 30 n. 19.) In view of where the cancer had spread by May 2000, "in the body" meant, at least, in the mediastinal area, including the lymphatic system, and the lungs, the body areas to which the initial cancer had spread by early 2000.

The conclusion that the evidence compels is that but for both the chemotherapy and radiatrion he received in 2000, firefighter Smith's Stage IV non-Hodgkin's lymphoma would have continued to spread and would have been fatal. This point is critical in assessing whether the initial cancer and the lung injury that likely caused it ultimately caused firefighter Smith's death in 2012, or whether the radiation treatment he received in 2000 was an intervening cause of death.

Dr. Dorfman, who analyzed the biopsied material obtained during firefighter Smith's May 9, 2000 anterior mediastinotomy, diagnosed "[i]nvolvement by Non-Hodgkins lymphoma, diffuse, large-cell type, B cell phenotype," and Dr. Swanson concurred. (Finding 15.) In reaching this diagnosis, Dr. Dorfman made a finding that effectively differentiated firefighter Smith's lymphoma as very aggressive. His pathology report noted that approximately 30-40 percent of the large cells of the mediastinal mass that was biopsied were "positive for the proliferation marker Ki-67 (MIB-1)," (Finding 14), a protein antigen found in the cell nucleus and present in all proliferating cells during the active part of the cell cycle, such as mitosis. (*See* Finding 14 n. 6.)

Ki-67 was being used by pathology and research laboratories by the 1990s as a prognostic or preditive marker in classifying lymphomas (such as the diffuse large B-cell lymphoma that firefighter Smith exhibited), differentiating "very aggressive" lymphomas from less aggressive or "indolent" ones, predicting lymphoma patient survival rates, and selecting the appropriate treatment regimen, such as chemotherapy and which type of chemotherapy to use. (*Id*.) In differentiating aggressive lymphomas from other types, and predicting patient survivability, laboratories may use a "proliferation index" (PI), which corresponds with the rate at which cells appear to proliferate. This is a percentage calculated by dividing the number of cells in a sample that stain positively for Ki-67 with the total number of cells in the sample, and multiplying by 100.

While the presence of Ki-67 was already in use by early 2000 by pathology laboratories to evaluate lymphoma biopsy specimens, it is not clear from the record that as of May 2000 the use of a "proliferation index" based upon Ki-67 was standard procedure at the Brigham & Women's Hospital pathology laboratory where Dr. Dorfman performed his analysis. Even if it was, the medical community had not reached a consensus as to what proliferation index was the "cutoff value" at or above which a lymphoma can be classified as aggressive. One medical journal article published in 2009 suggested that a PI of 45 percent is a cutoff value that can help clinicians distinguish an indolent lymphoma from an aggressive one. *See* A. Broyde *et al*., *Role and Prognostic Significance of Ki-67 Index in Non-Hodgkin's Lymphoma*, 84 AMERICAN JOURNAL OF HEMATOLOGY 338-43 (2009), http://onlinelibrary.wiley.com/doi/10.1002/ajh.21406/abstract (abstract of article and hyperlink to pdf version of full article). But that was no more than a suggestion.

It is not clear from his May 9, 2000 pathology report that Dr. Dorfman had intended to focus upon the presence of Ki-67 in the biopsied material as determinative in diagnosing firefighter Smith's lymphoma or assessing whether it was aggressive. (*See* Finding 14.) His report does not include a proliferation index computation, or refer to a PI index at all. His pathology report suggests that he, and Dr. Swanson, had intended to assess the lymphoma using a "kappa and lambda immunoglobin light chain study" of the biopsied material. As is still the case, that methodology was considered in 2000 to have prognostic value in assessing aggressive lymphomas such as diffuse large B-cell lymphoma, which was and remains the most common non-Hodgkin's lymphoma (NHL) in the United States, and in determining the appropriate course of chemotherapy when it is detected. *See, e.g.*, Maurer, M.J. *et al*., *Elevated Serum Free Light Chains Are Associated With Event-Free and Overall Survival in Two Independent Cohorts of Patients With Diffuse Large B-Cell Lymphoma*, 29 J. CLINICAL ONCOLOGY NO. 12, 1620-26 (Apr. 20, 2011), online ver., http://ascopubs.org/doi/full/10.1200/ JCO.2010.29.4413.[28] That point aside, "weak staining" of the

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[28]/ The Maurer article explains that:

> The free light chain (FLC) assay measures the concentration in the serum of immunoglobulin kappa (κ) and lambda (λ) light chains that are not attached to a heavy chain. Abnormalities in FLC are associated with plasma cell disorders. These abnormalities are monoclonal in nature and result in one of the chains being elevated, often substantially, producing an abnormal κ:λ ratio . . . Serum FLC abnormalities are prevalent in patients with DLBCL (diffuse large B -cell lymphoma), with 32% having elevated κ or λ concentrations and 14% of patients having an abnormal κ:λ FLC ratio . . . The most important parameter associated with outcome appears to be the absolute concentration of FLC rather than the κ:λ ratio. Increased serum FLC was strongly associated with an inferior outcome . . . There are several plausible causes of elevated FLC in patients with [diffuse large B-cell lymphoma] . . . [but] [r]egardless of cause, patients with elevated FLC have similarly poor outcome. This was true in both high-risk and low-risk patients . . . FLC is the largest single predictor of outcome . . . [and]

biopsied material from firefighter Smith's anterior mediastinotomy made it difficult to interpret the results of a kappa and lambda immunoglobin light chain study. (*See* Exh. 11: Dr. Dorfman's pathology report, May 9, 2000, at 1, second full para.) As a result, Dr. Swanson considered the May 2000 mediastinoscopy and biopsy to have been "non diagnostic" in assessing firefighter Smith's lymphoma as aggressive. (*See* Exh. 11: Dr. Swanson's operative report of bronchoscopy and other surgical procedures performed on Firefighter Smith on May 9, 2000).

The Ki-67 proliferation marker was present in the material biopsied in May 2000, nonetheless, and Dr. Dorfman noted its presence. It is unclear whether Dr. Dorfman intended to classify firefighter Smith's lymphoma as "aggressive" based upon the presence of Ki-67 and its utility as a prognostic marker in assessing the aggressiveness of lymphomas. His report suggests strongly, however, that Dr. Dorfman found the occurrence of Ki-67 that he detected (30-40 percent of the large cells of the biopsied mediastinal mass were positive for this proliferation marker) to be medically significant in terms of confirming the presence of a proliferative non-Hodgkin's lymphoma. Even though Dr. Dorfman did not compute a proliferation index, the 30-40 percent occurrence of Ki-67 that he detected in the large cells taken from firefighter Smith's mediastinal mass biopsy suggests that his lymphoma could be described at least as borderline aggressive.

It was certainly treated as such. Dr. Friedberg, the oncologist who oversaw Firefighter Smith's chemotherapy treatment, decided to schedule firefighter Smith for six cycles of CHOP chemotherapy. Since six cycles of CHOP chemotherapy were used to treat patients with extensive

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elevated FLC may perhaps be associated with a more aggressive tumor.

diffuse large B-cell lymphoma (*see* Finding 16 n. 8), Dr. Friedberg's choice of this therapy itself suggests that he viewed the firefighter's malignancy as aggressive. His notes confirm that he did indeed view it this way. He described the 30-40 percent range of large cells in firefighter Smith's mediastinal mass biopsy that were positive for Ki-67 (*see* Finding 14) as suggesting "a fairly aggressive malignancy." (Exh. 11: Dr. Friedberg's letter dated May 24, 2000.) Without question, the CHOP chemotherapy regimen that firefighter Smith received was commensurate with the treatment of a very aggressive form of non-Hodgkins lymphoma by whatever methodology the lymphoma's aggressiveness was assessed. The presence of an aggressive lymphoma correlated, unfortunately, with a poorer prognosis for the remission of firefighter Smith's cancer, even with the administration of six cycles of CHOP, followed by radiation if the tumor proved persistent (as it did here), which was the therapy of choice for treating aggressive lymphomas. To put it bluntly, because the cancer was likely to be fatal, the reasonable objective of chemotherapy and radiation treatment was remission that deferred this outcome for some unknown period of time, rather than a cure.

In view of this medical evidence, it is difficult to view the metastatic lung cancer that proved fatal to firefighter Smith in 2012 as anything but related directly to the Stage IV non-Hodgkin's lymphoma diagnosed in May 2000. Dr. Dorfman's analysis furnishes ample evidentiary support for viewing firefighter's lymphoma as one that did not go fully into remission and, having entered his lymphatic and system and part of his lung by early 2000, was ultimately fatal. It does not support viewing the cancer that proved fatal in 2012 as a new disease and the cause of death as an intervening one (the radiation administered to firefighter Smith in the summer and fall of 2000).

All of this medical evidence suffices to make out a prima facie direct case regarding the

second link in the chain of causation extending from firefighter Smith's lung injury in August 1998 to his death in 2012. As was true of the evidence regarding the first link in the chain of causation (firefighter Smith's development of non-Hodgkin's lymphoma as a result of directly inhaling smoke and toxic fumes for a prolonged period while fighting the August 1998 fire), causation is a medical issue, but the evidence suffices to get that issue before a medical panel.

iv. Was there an intervening cause of death?

The final issue is whether the radiation treatmen firefighter Smith received in 2000 was an intervening cause of death that interrupted an otherwise continuous, unbroken sequence of causatively-related events from the firefighter's August 1998 lung injury and his death in 2012.

I note first that the medical evidence shows a relationship between firefighter Smith's initial lymphoma and subsequent lung cancer. The 2012 medical records show that the cancer diagnosed in 2012 involved the lymphatic system as well as the lungs. (Findings 47 and 48.) The original lymphoma involved, per the scans completed in May 2000, the mediastinal region, which includes the lymphatic system and the lungs. (*See* Findings 12,13, 16 and 18.) In his May 24, 2000 notes, Dr. Friedberg recorded his impression that firefighter Smith's lymphoma was likely at stage IV "based on high suspicion of parenchymal lung involvement from his mass." (Finding 18). Advanced stages of non-Hodgkin's lymphoma, such as firefighter Smith's, involve the lung more frequently than do early stages of the disease, and lymphoma involving the lung parenchyma has a wide variety of radiologic appearances, including appearance on CT scans as a mass or mass-like consolidation. (Finding 18 n. 10.) There is other medical evidence in the record showing, in

hindsight at least, that what appeared from 2001 through 2011to have been symptoms related to the radiation treatment firefighter Smith received in late 2000 (for example, the persisting chest pain for which Vicodin provided only limited relief, *see* Findings 29, 36, 37, 41 and 43-47, and worsening shortness of breath, *see* Finding 40) may have been symptoms of lingering cancer in the mediastinal region and the lungs, to which the original lymphoma had spread as of May 2000.

Second, although firefighter Smith's lymphoma was noted as being in remission beginning in 2001, his cancer was not cured, and the tumor had not been eliminated from his body. Remission refers to the abatement of active manifestations of cancer that leave it manageable, which is not the same as curing it. (*See* Finding 30 n. 19.) Underscoring this point, firefighter Smith's treating physicians followed him regularly after his radiation treatments ended in late 2000 for signs that the cancer had returned. (*See, e.g.*, Finding 29, regarding Dr. Friedberg's February 5, 2001 notation "I think we have to be quite worried about the potential for recurrent disease.") Even if the regular monitoring and scans from 2001 through 2011 were also to follow for adverse effects of the radiation treatment, they were also always about monitoring for signs that the original tumor had returned, which was a risk in view of its advanced, aggressive state when it was diagnosed in early 2000 and its persistence following aggressive chemotherapy.

All of this shows, for the purpose of making out a prima facie direct case at least, that firefighter Smith's fatal metastatic lung cancer in 2012 was inextricably linked to the original, aggressive and metastatic lymphoma that was diagnosed in May 2000, which in turn was likely caused by the lung injury he sustained while fighting the August 1998 Gloucester Fisherman's Wharf fire. The radiation treatments that firefighter Smith received in late 2000 deferred an otherwise

inevitable death from the particularly aggressive non-Hodgkin's lymphoma he had developed in early 2000. Per the language of *Wallace v. Ludwig* (*see above* at 42), the radiation treatments may be said to have ultimately "assisted or accelerated" the re-emergence of the condition of cancer, but they did not break the chain of cancer causation set in motion by the lung injury firefighter Smith sustained in August 1998 when he directly inhaled smoke and toxic fumes while fighting the Gloucester Fisherman's Wharf fire for 12½ hours. The evidence in the record shows sufficiently that the firefighter's death in 2012 was not the result of an intervening cause that (again, per *Wallace*) was "so distinct from the original injury . . . as to constitute an intervening efficient, independent and dominant cause" of death." I do not determine, as a matter of medicine, whether that was indeed the case, or whether the radiation treatments superseded the firefighter's August 1998 lung injury as the the predominant cause of his cancer death in 2012. That, too, is a medical issue to be determined by a medical panel in the first instance. However, Mrs. Smith's prima facie case suffices to get the issue before a panel.

2. Medical Panel Review

PERAC declined to convene a single-member medical to determine whether Firefighter Smith sustained injuries during the 1998 Gloucester Fisherman's Wharf fire that resulted in his cancer death in 2012. It was convinced that the firefighter's death was caused by his earlier radiation treatments, which it concluded to have been an intervening cause of death, leaving no death in the line of duty caused proximately by the lung injury he sustained in August 1998 for a medical panel to consider. The Board denied Mrs. Smith's section 100 benefits application based upon PERAC's

decision. On appeal, I have concluded that in the circumstances presented, it could be found that firefighter Smith "while at the scene of a fire or any emergency [was] killed or sustain[ed] injuries which result[ed] in his death," per M.G.L. c. 32, § 100. The prima facie direct case that Mrs. Smith has made out suffices for her "killed in the line of duty" application to reach a medical panel.

That is where the application should be reviewed next. Although Mrs. Smith has made out a prima facie direct case, proximate causation of the firefighter's death as a result of the injury he sustained while fighting the August 1998 fire is a medical issue that should be resolved in the first instance by a medical panel rather than by this forum.

M.G.L. c. 32 does not require that a medical panel be convened to assess a section 100 "killed in the line of duty" benefits application, but nor does it prohibit PERAC from convening one. In this case, the Gloucester Retirement Board asked PERAC to advise if it would convene a single-member medical panel to determine whether Firefighter Smith sustained an injury during the 1998 Gloucester Fisherman's Wharf fire that resulted in his cancer death in 2012. PERAC declined to do so and opined, as well, that firefighter Smith's death in 2012 was the result of his radiation treatment in 2000 rather than the result of an accident sustained while performing his duties or injuries sustained while at the scene of a fire. The board relied upon PERAC's decision in denying Mrs. Smith's section 100 benefits application.

If PERAC decided to convene a medical panel, it is likely the board would have awaited the panel's certificate as to causation under section 100 before deciding Mrs. Smith's application. Neither party argues that, with the sufficiency of Mrs. Smith's prima facie case as to proximate causation made out by the evidence in the record, medical panel review would not be helpful to the

board in reaching a merits-based decision on Mrs. Smith's section 100 benefits application. "[D]etermining medical questions that are beyond the common knowledge and experience of a local retirement board's members" is a medical panel's recognized gatekeeper function. *See Malden Retirement Bd. v. Contributory Retirement Appeal Bd*., 1 Mass. App. Ct. 420, 423, 298 N.E.2d 902, 904 (1970) (identifying this function as to assessing accidental disability retirement applications under M.G.L. c. 32, 7(1)).

Mrs. Smith's claim unquestionably raises medical issues. One such issue is whether there exists a causal nexus between firefighter Smith's lung injury sustained while fighting the August 1998 fire and his development of Stage IV non-Hodgkin's lymphoma in 2000. Another is whether the firefighter's ultimate death as a result of metastasizing cancer in 2012 was related to the original lymphoma, or was unrelated and caused, instead, by the firefighter's radiation treatment for lymphoma in 2000. Mrs. Smith has made out a prima facie case that suffices for a medical panel to review her accidental disability retirement application and the medical issues it presents, including the two I have identified. The board has not stated that it no longer wishes to have a medical panel review Mrs. Smith's claim before it decides her section 100 benefits application on the merits. For these reasons, I conclude that a medical panel should evaluate causation for section 100 purposes, now that I have determined that Mrs. Smith's direct case suffices for panel review.

Disposition

For the reasons stated above:

(1) The April 18, 2013 decision of respondent Public Employee Retirement Administration

Commission (PERAC) declining to convene a medical panel to review Mrs. Smith's application for "killed in the line of duty" benefits pursuant to M.G.L. c. 32, § 100, on the ground that the metastatic lung cancer that caused firefighter Smith's death in 2012 was most likely related to radiation therapy he received to treat his lymphoma in 2000 rather than to his exposure to smoke, chemicals and paint fumes while fighting a fire at Gloucester's Fisherman's Wharf on August 16, 1998, is *reversed*;

(2) The subsequent decision of the Gloucester Retirement Board, on April 25, 2013, denying further action on Mrs. Smith's section 100 benefits application as precluded by PERAC's denial, is *reversed;* and

(3) Mrs. Smith's application for "killed in the line of duty" benefits pursuant to M.G.L. c. 32, § 100 is *remanded* to the Board for:

(a) The convening of an appropriately-constituted medical panel to review the application and related medical and other records and issue a certificate stating whether firefighter Smith's exposure to smoke and toxic fumes while fighting the Gloucester Fisherman's Wharf fire during a 12 ½ hour period in August 1998 caused him to sustain injuries that resulted in a condition of cancer that caused his death in 2012, specifically cancer in his respiratory and lymphatic systems that was first diagnosed in early 2000 as Stage IV non-Hodgkin's lymphoma with a tumor that had infiltrated the right lung; and

(b) The Board's issuance of a decision on Mrs. Smith's section 100 benefits application following the medical panel's certificate, and its response to subsequent questions the parties choose to ask the panel (if any).

SO ORDERED.

DIVISION OF ADMINISTRATIVE LAW APPEALS

Mark L. Silverstein
Administrative Magistrate

Dated: October 24, 2018