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By

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Abstract

Exploring the Computed Tomography over-utilization in diagnosing disease: How does over-utilization of Computed Tomography affect the patient outcome?

By

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Master of Public Administration, Health Administration

The high rise in radiation exposure due to unnecessary exposure to Computed Tomography (C.T.) has raised concerns and questions about high medical costs due to the overutilization of C.T. This study examined the utilization of C.T. and its effect on overall patient outcomes. It evaluates the cumulative effects that over-utilization of C.T. has on growing healthcare costs. It also compares the utilization of C.T. in the United States with other developed countries. This study also focuses on possible harmful effects that over-utilization of C.T. has on the public, as well as a review of potential policy resolutions. This study analyzed qualitative data from previously conducted peer-reviewed scholarly articles. Materials that were relative to this study were found on scholarly databases, such as JSTOR, ProQuest, Sage Journal, PubMed Central, American Roentgenology Journal, and EBSCO. The key words that were used to find relative articles included "Computed Tomography, C.T. over-utilization, radiation exposure, medical costs, limit radiation exposure and Risk-Standardization. Non-Peer-reviewed journals were also included through government websites, such as CMC, CDC, and FDA, to include real data and analysis. This study found that C.T. utilization has dramatically increased since its discovery. It
has also been shown that over-utilization of C.T. is a significant contributor to medical spending and high radiation exposure to the public, which should be an area of concern for policymakers. When FDA introduces standardized risk assessment while ordering C.T. studies, there are observations made on reducing C.T. utilization rate and lowering medical spending. The reimbursement models need to be reviewed and standardized to help reduce the utilization rate. California legislative Bill SB1237 is reviewed, and a broader scope of the bill is introduced to help combat the increasing radiation dose to the public. FDA has also introduced the risk standardization and standard reimbursement option to help reduce the incentive of over-utilization of C.T. for physicians. A value-based service model is introduced and shows improvement in the reimbursement model. Policymakers should review the value-based model as it showed evidence of reduction of C.T. orders upon adoption. Reducing the incentive to physicians for ordering unnecessary C.T. by reducing reimbursement to only cover a single C.T. ordered per patient visit will help reduce the medical cost to the patient and reduce the overall radiation dose. Economic implications are shown, and by adopting practices from other countries with well-performing healthcare models, like Norway and Germany, the U.S. could potentially reduce wasteful spending and achieve universal healthcare coverage that would ensure access to care for everyone and promote preventative care.
Introduction

The United States of America has some of the worst performing healthcare systems in the world. Commonwealth Fund ranks #11 last on the list among 11 developed countries in 2021 regarding access to care, care process, administrative efficiency, equity, and healthcare outcomes (Shneider et al., 2021). The study by Shneider et al. (2021) found that the United States performed the worst in terms of affordability. When the information compared U.S. population access to care based on income-related disparities, the U.S. scored last on the list compared to other countries. In federal and state-run health insurance marketplace such as Covered California, costs were 18% higher than employer-sponsored insurance (ESI) (Shneider et al., 2021). With a life expectancy of 78.8 years, the United States paid $11,582 per person yearly in 2019 for healthcare. Per capita spending grew at a 10-year annual average of 3.6% between 2009 and 2019. Sweden, the second greatest spender, spends $6,325 per person yearly, with an average life expectancy of 82.9 years. A recent analysis estimated that between $760 billion and $935 billion of annual health care spending in the United States is unnecessary. Low-value care or excessive treatment, which may include drugs, tests, treatments, and procedures that are ineffective or even potentially harmful, accounts for 10% of these costs (Tikkanen & Abrams, 2020). Papanicolas et al. (2018) provided a new perspective on a classic U.S. health policy narrative in their issue of JAMA. According to the findings of the study by Papanicolas et al. (2018), when compared to ten other high-income nations (the United Kingdom, Canada, Germany, Australia, Japan, Sweden, France, the Netherlands, Switzerland, and Denmark), the United States spends twice as much per capita on health care compared to those countries, yet many health outcomes in the United States are significantly worse (Papanicolas et al., 2018). At both the macro (government programs and expenditure) and the micro levels (clinical decision-making by physicians concerning prescription
tests and treatments), the U.S. healthcare system is not cost-effective, resulting in increased spending without improved quality criteria. Comprehensive healthcare reform is required in the United States to deliver high-quality care at a reasonable cost (Scheunemann, 2011). To help reduce healthcare costs, this research will need to understand the primary drivers contributing to the current condition.

The number of patients in the United States who underwent computed tomography (CT), magnetic resonance imaging (MRI), and ultrasound procedures increased significantly between the years of 2012 and 2018. Compared to other physician-provided services, medical imaging usage increased the most among Medicare recipients. The sharp rise in the demand for imaging services can be attributed to technical developments, physician and patient demand, and powerful financial incentives (Shrank et al., 2019). Diagnostic imaging aids in the accurate diagnosis and treatment of disease, but it can also increase costs and harm patients due to incidental findings, overdiagnosis, and excessive radiation exposure that is associated with a higher risk of developing cancer. According to estimates, more than 30% of imaging tests are not necessary, costing the US economy somewhere around $30 billion a year.

A recent study conducted by Smith-Bindman et al. (2017) that compared the United States to ten other countries on a variety of metrics found that the United States ranked either first or second in the number of CT and MRI scans that were performed for every 1000 members of the population. This finding was based on the findings of the study study that compared the United States to the other countries (Smith-Bindman, 2019). According to a piece of writing that was produced by Bellolio et al. (2017), the utilization of computed tomography (CT) has skyrocketed over the past decade, with approximately 80 million CT scans being performed annually in the United States. According to the findings of a number of studies, the utilization of CT scans in
emergency departments (EDs) for the treatment of a variety of common complaints has significantly increased. C.T. has become the primary imaging modality utilized in assessing trauma patients due to its sensitivity in detecting traumatic injuries. Fall-related injuries have developed as a substantial epidemiological problem due to the U.S. population's aging. Hospitalization costs for seniors injured in falls are expected to reach more than $20 billion annually (Bellolio et al., 2017).

Concerns about the overuse of C.T. and the patient's clinical outcome have been raised on numerous occasions (Ip et al., 2015). Concerns about the patient's ability to pay their higher medical bills following each visit to the emergency room have been brought up in light of the widespread use of imaging studies, in particular CT scans. Radiation safety is an additional concern, and it needs to be the most important consideration when the exam is being ordered (Hong et al. 2020). Diagnostic testing overuse has been addressed by the American Board of Internal Medicine Foundation's Choosing Wisely campaign and payer measures to reduce imaging reimbursements. These initiatives are commonly credited for lowering imaging rates among Medicare members. However, most assessments have focused on costs rather than use, and changing billing procedures, such as the bundling of frequent exams, make assessing utilization and prices more difficult. Imaging costs may not fully represent use or possible hazards (Shetty et al., 2015). No substantial studies have been conducted to estimate current imaging utilization rates across various patient demographics, such as those in integrated health care systems. Only a few studies have examined imaging trends throughout time.

The main focus of this project was to discuss the effect of waste caused by the overutilization of C.T. This project also explores risk standardization and see if a risk standardization policy at the hospital reduces the amount of C.T. ordered as opposed to hospitals
that do not have a risk-standardized policy present. Some of the questions that this project is addressing are the following: 1) Does the overuse of C.T. benefit the patient's overall treatment plan? 2) Is there a correlation between high use of C.T. and geographic characteristics? 3) How does the use of a C.T. benefit the patient's outcome? This project explores factors determining if the excessive use of C.T. contributes to waste and higher medical costs.
Background

Recent events have brought to the attention of policymakers in a number of countries the improper application and excessive utilization of a variety of advanced diagnostic imaging technologies. This concern has not only led to an increase in the cost of healthcare in countries, but it has also had negative effects for people's health. Incorrect or unnecessary use of advanced medical imaging modalities can be contributed to a variety of factors, including patient-related, physician-related, technological, and eventually radiologist-related concerns. Because of this, policymakers are required to issue new recommendations to encourage all service providers to adopt such strategies in an appropriate manner. The most common approach taken in this context is to make use of clinical guidelines and decision support systems (Hadian et al., 2021).

There has been a significant increase in the utilization rate and use of C.T. to diagnose patients in E.D. and other medical settings. Understanding if the trend is beneficial and contributes to a better outcome of the patient treatment plan is critical. In addition, understanding the issue of over-utilization and how it affects the patient's radiation exposure will explain the risk of increased radiation exposure to the public. Lastly, understanding why physicians choose C.T. as an imaging study will help gain greater insight into how the crisis developed and how it impacts the rising medical cost (Shinagare et al., 2014).

Utilization of C.T. in Medicine

C.T. imaging is considered the most significant advancement in radiology since its discovery by the U.S. medical community. It helps diagnose severe conditions and expedite interventions with the exam speed. The C.T. has not always been so advanced. The first C.T.
scanner in the U.S. was installed in June 1973 at the Mayo Clinic in Rochester, MN. By 1974, 44 systems were installed at medical facilities around the country. Less than four years later, after introducing C.T. imaging in the U.S., at least 400 CT systems were installed. Today the U.S. has between 6,000 and 7,000 machines installed and 72 million scans performed annually just in the United States. It is estimated that in 2022, 84 million C.T. scans will be performed in the U.S. (Power et al., 2016).

The C.T. system made many imaging technologies obsolete. However, the rapid adoption of CT systems, their frequent use, and the resulting rise in healthcare costs all caught the attention of federal and state policymakers, who specifically wanted to set guidelines for the purchase and use of diagnostic technologies. In the beginning, C.T. imaging was only used to diagnose neurological applications. However, after 30 years, the capabilities and applications of C.T. have grown as a result of technological and computer advancements. While neurological disorders continue to be the most common reason for C.T. imaging, many other medical disciplines (cardiology, emergency departments, general surgery, and many other department) have found C.T. imaging to be the comprehensive tool for diagnoses (Stockburger, 2018). As a result, there is a growing clinical need for CT imaging. Even with government restrictions on its use and acquisition in healthcare facilities, the development of C.T. imaging has been financially successful. The cost of healthcare has gone up due to CT scanning, but the value it has brought to American medicine is enormous (Schmidt, 2012).
Methodology

This study uses archived data from peer-reviewed journal articles to conduct a qualitative analysis. Two academic databases, PubMed and JSTOR, were searched on June 1st, 2022, to find pertinent literature. "California AND Medicaid AND imaging utilization AND policy AND excessive radiation exposure" were the search terms. In order to improve the results, search filters were added. English-language, peer-reviewed, academic journal publications published between 2012 and 2022 were the search filter criteria. Because PubMed did not provide that subject filter, a health policy subject category was only applied to the JSTOR database.

JSTOR initially produced 118 search results, while PubMed returned 65. Each article's title was examined. Based on a title review, articles discussing clinical interventions or clinical outcomes were disregarded. A total of 125 articles, 25 from PubMed and 100 from JSTOR, were eliminated as a result of the article title review. For further analysis, a total of 36 articles—29 from PubMed and 7 from JSTOR—were included. Three categories were established based on the content of the abstracts for all articles through the qualitative analysis process. The three categories were health insurance, population, and special group radiation exposure.

Finding common themes among the full articles that were chosen for inclusion required additional review. Ten of the articles focused on aspects of health plans like cost-containment initiatives, risk-standardization, or radiation reporting measures. Additional 10 articles focused on access to healthcare due to wasteful spending, access restrictions, waste reduction initiatives, and radiation mitigation strategies. The main focus of seven articles was on the equity of care and health of special groups, including those with high radiation exposure, those with commercial insurance, people with different ages, and those with private insurance.
Literature Review

This section will focus on data published in the literature regarding the utilization of C.T. and medical necessity. First, the over-utilization of C.T. and its effect on medical waste and cost are discussed. Second, the role of physicians and radiation exposure are discussed. Finally, patient geography and variation in utilization of C.T. are compared and analyzed to determine if patient geography impacts the utilization rate of C.T.

Medical Necessity of C.T. and Radiation Exposure.

Imaging is one of the most essential and complex aspects of rising healthcare costs. According to the American College of Physicians, surplus imaging costs the healthcare system between $200 billion and $250 billion yearly. Excessive usage of medical imaging may compromise its societal benefit due to shifts in the cost-benefit ratio. With increased complexity and expensive technologies, outpatient expenditures are rising quicker. Radiation concerns are growing by the day as a result of needless radiology, particularly in the case of computed tomography scans. The advantages of utilizing imaging should outweigh the dangers of radiation exposure. Unsuccessful tests impose a significant financial burden on society, limit access to patients in need, expose patients to severe dangers without providing appropriate benefits, and may not improve (or worsen) health care quality (Hadian et al., 2021).

Over the past ten years, C.T. use has significantly increased, with over eighty million C.T. scans completed annually in the United States. (Brinjikji et al., 2015). Papanicolas et al. (2018) conducted research comparing how much other nations and the United States spend on gross domestic product. The United States allocates 19.4% of its gross domestic product (GDP) to healthcare costs. Comparing these expenditures to those of other nations reveals that other nations
spend between 9.6% and 12.4% on healthcare. The United States' use rate was comparable to those of other nations, except for medical imaging. The United States had the highest volume of MRI scans and the second-highest volume of CT scans out of all 11 countries “(118 MRIs per 1000 population, compared with a mean of 82 per 1000 population for all 11 countries; 245 CTs per 1000 population, compared with a mean of 151 per 1000 population for all 11 countries”; Papanicolas et al., 2018).

Several studies indicate that the utilization of C.T. in emergency departments (E.D.) for several common symptoms has grown dramatically. Due to C.T.'s sensitivity to identifying traumatic injuries, C.T. has become the imaging modality of choice for evaluating trauma patients. Due to the aging of the U.S. population, fall-related injuries have become a serious epidemiological issue. The yearly hospitalization costs connected with fall-related injuries among the elderly are anticipated to exceed $20 billion (Brinjikji et al., 2015).

Using the E.D. section of the National Hospital Ambulatory Medical Care Survey, a retrospective study was conducted from 2001 to 2010. (NHAMCS). In assessing changes in C.T. usage in this cohort from 2001 to 2010, the correlation between C.T. utilization and the proportion of E.D. visits during which a life-threatening disease was identified as the most noteworthy finding. The ninth version of the International Classification of Diseases incorporated codes for life-threatening diseases, including skull fractures “(800. x–802.xx, 803. x–804.xx), spine fractures (805. x–806.x), cerebral hemorrhage (852. xx–843.xx), liver lacerations (864. xx), and spleen lacerations” (Brinjikji et al., 2015). The study analyzed trends in C.T. use and the proportion of patients with life-threatening illnesses among fall patients in each age group from 2001 to 2010. This study also analyzed technology usage features throughout this period (Brinjikji et al., 2015).
Effect of C.T. use on Medical Cost

Imaging services are a significant driver of healthcare expenditures, primarily in the E.D.; physicians, payers, and policymakers want information regarding imaging usage when building healthcare delivery systems. This study conducted by Brinjikji et al. (2015) examined trends in the use of C.T. among adult fall patients in the United States. In addition, the study analyzed demographic and clinical parameters linked with C.T. usage and updated estimates to account for patient characteristics that may influence utilization rates.

According to the Medicare Payment Advisory Commission's (MedPAC) report comments to the Centers for Medicare and Medicaid Services (CMS), the growth in the volume of medical services per Medicare beneficiary outpaced the growth of all other services provided by physicians. Imaging spending, for example, more than doubled from $8.6 billion to $18.7 billion between 2011 and 2020, an average growth rate double that of physician fee schedule services (Shneider et al., 2021). Diagnostic imaging expenditures are among the fastest-growing Medicare expenses, and imaging costs for Medicare beneficiaries with cancer increased faster than overall spending for Medicare beneficiaries with cancer from 1999 to 2006. Diagnostic imaging services and their costs have climbed twice the inflation rate in the last decade (Armao et al., 2011).

An article by Shinagare et al. (2014) looked at the rising use of medical imaging and its expenditures, which has drawn increased scrutiny. Imaging has significantly contributed to medical practice by assisting in the diagnosis and treatment of disease. However, there is growing concern about overuse and inappropriate use of imaging, which is causing waste and potentially harming patients by exposing them to unnecessary ionizing radiation, which has been linked to cancer. Radiology benefit management schemes, public education efforts such as Image Wisely
and Image Gently, and federal regulation of health information technology (HIT) use have been used to optimize imaging use. The promise of computerized decision support systems to enhance quality and decrease waste has been the subject of federal regulation for meaningful HIT use (Stage II). As a result, it is critical to assess short- and long-term patterns in imaging utilization to pinpoint regions where adjustments are most likely to make a difference (Shinagare et al., 2014).

**Effect of Over-Utilization on Excess Radiation exposure**

Over-utilization of C.T. imaging causes a higher medical cost and increases the radiation exposure to the patient. There is considerable evidence that over-exposure to unnecessary radiation can cause cancer in a patient. Due to the evidence linking exposure to low-dose radiation to the development of solid organ cancers and leukemia, the rapid increase in C.T. utilization has prompted significant public concern regarding the doses of ionizing radiation delivered during scanning. A threshold risk model may be more applicable at cumulative doses of 100 mSv or more, with the danger increasing exponentially. However, the medical community must limit radiation dosages "as low as is reasonably achievable." Each imaging method must be justified and optimized, and obtaining a diagnostic C.T. with the lowest possible radiation dosage should remain the objective in each clinical setting (Power et al., 2016).

The most recent medical imaging overexposures were noted in 2008 when a 2.5-year-old boy was sent to Mad River Community Hospital E.R. in Arcata due to a minor neck injury. The cervical spine C.T. was performed 151 times in 68 minutes due to medical error and equipment malfunction. This incident resulted in a significant over-radiation to the patient and erythema. A major hospital, Cedars-Sinai, brought a similar incident to the public attention. Approximately 260 patients received a C.T. brain perfusion imaging and received eight times higher than the
standard radiation dose due to wrong scanner settings. Patients started noticing sudden hair loss and other symptoms linked to over-exposure to radiation (Lee et al., 2012).

Abuse of computed tomography scans is a complicated and multi-faceted problem that can be attributed, at least in part, to medical uncertainty, the fear of being sued for malpractice, the nearly ubiquitous availability of computed tomography machines, and strong patient demand. However, a significant portion of the problem is caused by the widespread belief that imaging with CT is, in most cases, risk-free. This widespread belief has led to the unrestricted expansion of this practice, which in turn has caused a significant portion of the problem. Patients as well as medical professionals hold this belief. Because the carcinogenic risk of cancer that may come decades after exposure may appear to physicians to be so remote, it is easy for the immediate potential benefit of C.T. to eclipse the complete examination of whether it is necessary. This is because it is easy for the immediate potential benefit of C.T. to eclipse the complete examination of whether it is necessary. Nevertheless, an excessive amount of diagnostic testing may bear near-term harms, such as the following: giving false-positive results too frequently, which may lead to a cascade of additional testing; overdiagnosis, which may result in unnecessary treatments; and wasting time that could be spent on treatments that have a more significant impact on the patient's condition. These risks are difficult to understand, and even more difficult to convey to patients in the limited amount of time that clinicians have for consultations (Smith-Bindman et al., 2019).

In the study that was conducted by Bastiani et al. (2021), a total of 2866 patients were polled and tested on their knowledge of the radiation risks that could be caused by an imaging study. The questionnaires were distributed to patients in a variety of age brackets. The research was carried out in a multicenter, cross-sectional setting with the purpose of testing patients'
awareness of the risks associated with medical radiation. The findings revealed "a lack of knowledge" regarding even the most fundamental radiation safety concerns. One third of respondents were unable to identify computed tomography as a radiation-based modality, and more than half of respondents were unaware that chest computed tomography delivers more radiation than chest radiography: the relative radiation dose is approximately one hundred times higher. This finding is consistent with the growing body of information on these topics. Even more tragic, forty-four percent of respondents felt that their knowledge of the risks posed by radiation was insufficient, and more than half of them had not received any information regarding the safety of radiation prior to their scan (Bastiani et al., 2021).

In the study by Mamlouk et al. (2012), it was found that having a C.T. angiogram positive for P.E. is extremely unlikely in the absence of thromboembolic clinical risk factors (0.95 percent chance). Only 6.36 percent of patients in this clinical setting had a C.T. angiogram that was positive for PE, compared to 90.16 percent of patients who had a negative angiogram (24). Contrarily, all patients' P.E. risk factor assessments had sensitivity and negative predictive values of 97.46 percent and 99.05 percent, respectively (Mamlouk et al., 2012). A rate this low highlights the significance of assessing clinical risk factors before imaging.

**Diagnostic Imaging Utilization among Medicare and Commercially Insured Adults**

The majority of data on trends in noninvasive diagnostic imaging (NDI) utilization rates has come from Medicare patients. The study by Hong et al. (2020) looked at NDI trends in claims databases for all persons enrolled in fee-for-service Medicare and for nearly 9 million commercially insured patients per year between 2003 and 2016. Patients with commercial insurance were separated into two groups: those aged 18–44 and those aged 45–64. The identical
NDI procedure codes were applied to Medicare and commercial claims, and rates per 1000 participants were determined. They provided trends across time, followed by modality (C.T., MRI, nuclear imaging, echocardiography, U.S., radiography). All instanced Medicare enrollees had a higher utilization rate for all modalities (Hong et al., 2020).

To combat the higher use of advanced medical imaging, CMS has enacted "The Protecting Access to Medicare Act (PAMA) of 2014, section 218(b)", which would help ensure the appropriate diagnostic imaging services are being provided to Medicare beneficiaries. This program would ensure that all Medicare enrolled individuals are appropriately screened, and orders are reviewed for appropriateness through electronic portals to access appropriate use criteria (AUC; CMS, 2014).

Hentel and Wolk (2019) compared the diagnostic imaging use between Medicare and commercially insured individuals in their article. One of the reasons that the article notes is that the Medicare-insured individuals are primarily older and would be more prone to getting imaging services than the individuals insured commercially, generally younger individuals and more likely to be in a better health condition. The article also found that Medicare individuals had higher use of diagnostic imaging than commercially insured individuals. The article has also discussed the Medicare efforts done by CMS to ensure that the AUC is used when diagnostic imaging exams are ordered would help reduce reimbursement criteria for commercially reduced individuals (Hentel & Wolk, 2019).

Effect of Risk Standardization on Order Volume

During the past three decades, the utilization of C.T. has increased dramatically. A study conducted by Taylor et al. (2018) examines if utilizing indication-specific risk standardization
effects, the amount of C.T. ordered through the Emergency Department. Seven clinical cohorts were examined to evaluate if the most performed C.T. studies included patient indications for the study ordered. The results showed that during the study, when looking at 136,938 E.R. admitted patient’s majority of the studies had at least one clinical reason present, and 34,235 CT scans were performed. Another study examined a hospital with a trauma center rated as level I with an annual census of around ninety thousand patients, as well as a hospital with a level 2 trauma rating with an annual census of around seventy thousand patients, an E.R. department with an annual census of around seventy-five thousand patients, and an E.R. department with an annual census of around thirty thousand patients. According to the study, risk standardization significantly impacted diversity in C.T. utilization and emergency physician profiling in this multisite investigation of C.T. consumption. To establish a valid performance assessment and improve emergency care value, hospital management and policymakers should integrate risk standardization in future measurements of physician imaging to help reduce C.T. use and ensure that the study ordered brings diagnostic value to the patient’s overall outcome (Taylor et al., 2018).

In a comprehensive review of clinical indications, Fingers et al. (2018) investigated the correlation between clinical indication, location of the symptoms, and duration of the symptoms that matched the ordered exam. The review was conducted based on the total of 800 C.T. exams of chest C.T. and Abdomen/Pelvis C.T. The results showed that the physician completed an indication for the study in less than 50% of the exams ordered (Fingers et al., 2018). The results suggested that the hospital adopt an electronic system that would prompt the physician questioner and remind the physician to include more detailed signs and symptoms to make the exam diagnoses more accurate and reduce the delay in the examination. Also, good signs and symptoms would
allow the radiologist and technologist to review the order and suggest a better exam or alternative exam based on the signs and symptoms (Fingers et al., 2018).

In the third study, the authors looked for opportunities to reduce the amount of C.T. ordered. Armor et al. (2012) looked at the overuse of high-cost imaging modalities, particularly computed tomography (C.T.), described in this article (C.T.). Overuse of C.T. is more statistically significant and presents a high risk of harm to patients, notably the creation of radiation-induced cancer dangers. The usage of Radiology Business Managers is described as a method for controlling the over-utilization of C.T. and as a possible strategy to limit the number of exams ordered by physicians. The need for proper usage is emphasized, focusing on computer-based medical decision assistance. However, there are barriers to the appropriate application, with medico-legal liability concerns at the top of the list. Finally, the authors advise that radiologists take the lead in the investigation (Armao et al., 2012).

**Kingdon Conceptual Framework:**

Kingdon's policy, which aims to address the social determinants of health, offers the best justification for the conceivable formulation of the comprehensive Medicaid concept. As a result of this policy, supporters of proposals are given the chance to promote their preferred problems and pet solutions. The opportunity windows in the public policy system also tend to periodically close and reopen based on this policy. This is a fantastic chance to take the initiative on some projects. This policy states that business proposals and issues should be prepared for those opportunity windows to open. Since they allow participants to present their ideas, issues, and concerns and combine them with the political forces into the decision-making occasions, policy windows are regarded as a crucial part of the process (Kingdon, 2011). Kingdon's (2011)
framework helps put the effects of excessive CT use on the healthcare system in perspective and shows how three streams are creating a window of opportunity for the implementation of a policy that would increase CT utilization and cut down on healthcare spending.

**Problem**

A 2.5-year-old boy was sent to the Mad River Community Hospital E.R. in Arcata, California, on January 23rd, 2008, following a minor neck injury, for which a cervical spine C.T. was performed. He was scanned 151 times in 68 minutes by accident, resulting in a significant radiation overdose and erythema. The hospital, on the other hand, did not disclose the overdose to the California Department of Public Health. According to reports, the incident was caused by a mix of human error and technical malfunction. Similarly, due to incorrect scanner settings at Cedars-Sinai Hospital in Los Angeles, up to 260 patients receiving C.T. brain perfusion imaging got up to 8 times the typical radiation dosage. As a result of these occurrences of radiation overexposure, statewide legislation was changed to demand the documenting of radiation dosage on C.T. scans and in patients' medical records (Lee et al., 2012).

**Political Circumstance**

The federal government hasn't given C.T. regulations much regulatory attention. In actuality, the FDA's approval of CT scanner manufacturers has been the main source of government regulation of CT. Both national accreditation standards for CT scanner technicians and significant government oversight of hospital-based or nonhospital imaging facilities are absent. On the other hand, hospices, home health agencies, clinical labs, and ambulatory surgery centers have been subject to strict government certification standards for decades (Harvey & Pandharipande, 2012).
To discover holes in the present regulatory legislation, the federal government invited radiologists, technicians, and industry professionals throughout the country to examine C.T.’s safety. On February 26th, 2010, the Subcommittee on Health of the House Committee on Energy and Commerce heard evidence titled "Medical Radiation: An Overview of the Issues" (Harvey & Pandharipande, 2012). In addition, on March 30 and 31, 2010, the FDA held a conference titled "Device Improvements to Reduce Unnecessary Radiation Exposure from Medical Imaging." While only a few specialists and stakeholders testified to Congress and the FDA, the debate constituted a preliminary articulation of particular issues with C.T. safety and included proposals for future change. From the hundreds of pages of expert testimony and questions generated by the hearings, three major components of the C.T. safety problem emerged: physician mistakes, C.T. overuse, and uneven dosage optimization (Harvey & Pandharipande, 2012). Senator Alex Padilla introduced a legislative bill SB 1237, requiring hospitals and clinics to report the radiation dosage of all C.T. scans performed. In addition, the bill would ensure that a CMS-approved organization accredits C.T. equipment; it requires institutions to report any overdose to the patient, treating physician, and the California Department of Public Health. Among the supporters of the bill was the Sacramento-based California Radiologic Society. Society stressed that the public must know how much radiation they receive before the exam. The FDA was also developing its radiation safety measures and favored the bill proposed by the California Senate. The bill was supported by many consumers and patient organizations, including the California Consumer Federation. However, CRS, which represents California radiologists in lobbying, has remained neutral on the legislation due to concerns about the difficulty of complying with its reporting requirements. The California Radiological Society opposed the bill due to the requirement to report repeat C.T. scans. Another association that opposed the bill was the California Hospital Association, as the bill would
be too strict and impossible to adopt. American G.I. Forum (a Congressionally chartered Hispanic veterans and civil rights organization), Children's Advocacy Institute, Breast Cancer Fund, American Association of Retired Persons, California Nurses Association, Consumer Federation of California, Congress of California Seniors, and Consumer Attorneys of California all supported the bill (Moan, 2020). The bill was enacted with no objections.

Policy (Solution)

This bill directly responds to many occurrences of radiation overexposure in California in 2008 and 2009. The bill made it a requirement that CMS accredit all C.T. scanners by January 1st, 2013, and annual equipment calibration verification needs to be performed. Hospitals and clinics that use C.T. technology for clinical tests must report cumulative radiation exposures on C.T. images and inpatient medical records under this rule. Any overdoses must be reported to the California Department of Public Health, the patient, and the ordering physician. A radiation dosage that exceeds 20% of the recommended amount is known as an overdose. In summary, the radiation control law reflects a significant milestone in radiation safety legislation with far-reaching implications (Lee et al., 2012).

Due to the excessive use of C.T., California passed legislation to make it easier to track each patient's annual radiation dose. Following widely reported instances of diagnostic CT overexposure, the state of California passed the first regulations limiting CT dose. The legislation, which became California Senate Bill 1237, stipulates additional guidelines for reporting C.T. doses among other things. Every radiological report must include the volume CT dose index (CTDIvol) and dose-length product (DLP) when CT scanner data is available. Even though the protocol page can be incorporated into the report, it is insufficient to just send dosage information to the PACS. Another choice is a dose unit recognized by the American Association of Physicists in Medicine.
Dose reporting requirements do not apply to PET/CT, SPECT/CT, or CT scans used only for attenuation correction during radiation treatment planning (Zucker et al., 2015).

Despite the controversy surrounding its benefits, California law now mandates C.T. dosage reporting, necessitating strict adherence. The radiologist, who is ultimately accountable for the content of the radiology report, is in charge of it. Prior to Senate Bill 1237, a recent quality improvement project carried out at another institution resulted in a 92 percent compliance rate with the C.T. dose report after using radiation dosage statement templates for a year. The presence of C.T. dosage characteristics, rather than their accuracy, was the definition of compliance in this study (CTDvol and DLP). Furthermore, it was carried out before Senate Bill 1237 became a legal requirement rather than after it did. The bill's sponsors and introducers are Alex Padilla and Elaine Alquist (Zucker et al., 2015).

This bill has helped reduce the overexposure rate in California due to the vigorous tracking and reporting system enacted with the help of the bill. This is a unique bill that is not present in 48 states. Zucker and Barth (2015) surveyed California-based physicians and found that 138 physicians (11%) replied to the study, and 132 people (96%) knew what SB 1237 entailed. 126 and 115 (93 percent and 85 percent, respectively) of the 135 respondents were aware of the need to submit C.T. dosage index volume and dose-length product. Dosage reporting was linked to a greater understanding of proper dose limits by sixty of 134 (45%). In response to SB 1237's legislation, 29 of 133 (22 percent) had changed their protocols. 5 (16%), 23 (74%), and 3 (74%), respectively, of the 31 respondents had adjusted protocols for only children, both adults and children, and only adults. Automated dosage reporting was employed by 24 of the 129 participants (19%), whereas dictation/transcription and template-assisted speech recognition were used by 48
and 57 percent, respectively. Delays in completing C.T. reports were mentioned by 40 of 134 people (30%) (Zucker et al., 2015).

California and Texas are the only states that have enacted a bill that protects the public and requires dose reporting for all C.T. exams performed. When comparing California's C.T. rate to the state that does not have a bill, California has one of the lowest utilization rates and Medicare spending per beneficiary. According to the Massachusetts Health Policy Commission (2020) report on the utilization rate of medical imaging services, the U.S. ranked # 27 among 50 states. The highest ranked states were the District of Columbia, Maryland, and New York, and all of these states have no formal policy in place to help reduce the utilization rate, such as bill SB 1237 (Massachusetts Health Policy Commission, 2020). Also, when comparing the U.S. population rate among all 50 states, the study conducted by Rosenkrantz et al. (2015), where the study looked at Medicare spending on imaging services among all 50 states. New York and Florida spend more on imaging services than California. New York spends 367.25 dollars per beneficiary for imaging services. Florida spent 355.67 dollars per beneficiary for imaging services, and California spent less among those two states spending 283.37 per beneficiary on imaging services. California was ranked among the state with the highest population. It spends less on imaging services compared to states that are close to population sizes like Florida and New York. This spending variance could be attributed to California having the bill SB 1237 as opposed to Florida and New York, which do not have a bill in place (Rosenkratz et al., 2015).

Having robust tracking metrics for radiation safety is one of the proposed initiatives being developed by FDA to reduce patients' needless exposure to radiation. In order to promote radiation safety in all states, the FDA proposed the creation of information systems and analysis tools to track radiation safety indicators. Dose registries can be used to benchmark imaging practice by
generating diagnostic reference values and improving radiology practice through quality control. Dose registries collect equipment parameters and dosage for imaging tests. The long-term objective is to automatically update dose registries in real-time so that exam parameters and dosage indices can be compared to predetermined reference values, allowing for the early identification and mitigation of patient safety risks. When negative events are tracked, patterns can be found that allow for the early identification and correction of potential radiation safety problems using tools or operator training (FDA, n.d.).

The FDA has started an initiative to help patients reduce and limit the amount of radiation they receive because not all states have legal requirements for dose tracking. One of these initiatives is the possibility that the FDA will impose requirements on CT and fluoroscopic equipment, such as the need to record the radiation dosage value from each exam and attach it to the study image in order to make it simpler to save dose information in a patient's paper or electronic medical record. Additionally, the FDA might mandate that devices automatically record radiation dose data in a standardized Digital Imaging and Communications in Medicine (DICOM) structured report and transfer it to a patient's electronic medical record or a dose registry. With the aid of such measures, doctors will be able to inquire about a patient's imaging and radiation dose history in greater detail, enabling them to decide on the best clinical course of action for that patient with greater knowledge (Center for Devices and Radiological Health, 2019).
Economic Implications

Over-utilization of C.T. impacts the overall cost of medicine. The rising cost of medicine causes many not to be able to afford medical coverage or seek care at a late stage of care. Hadian et al. (2021) showed an example of negative externality due to high imaging costs in the healthcare system, between $200 billion and $250 billion each year. Due to changes in the balance between outcomes and costs, overuse of medical imaging may compromise its utility to society. Outpatient expenditures are increasing at a quicker rate as technology becomes more complicated. Radiation concerns are growing by the day as a result of needless radiography, particularly in the case of computed tomography scans. The advantages of utilizing imaging should exceed the dangers of radiation exposure. Unsuccessful tests add to society’s financial burden, limit access to people in need, expose patients to severe hazards without offering enough benefits, and do not improve (or perhaps worsen) health care quality (Hadian et al., 2021).

Overspending and no restrictions imposed on the wasteful ordering of imaging studies contribute to a significant economic and public concern that healthcare would get more expensive and fewer people would be able to afford it. A study by Shrank et al. (2019) showed that the estimated cost of waste in U.S. healthcare spending is from $760 billion to 935 billion dollars, equating to 25% of all spending. These numbers prove that wasteful spending causes a higher cost of medicine and attributes to the biggest problem that U.S. healthcare faces: access to affordable care and the promotion of preventable treatment.

Hadian et al. (2021) have shown that over-referrals to diagnostic imaging tests have been linked to various factors. Referral patterns, for example, are linked to physicians' perceptions of themselves. Furthermore, social variables and physician-patient interactions considerably impact referrals for subsequent diagnosis. Other variables influencing the increased usage of imaging
techniques include technological advancements, an older population, technology accessibility, and a rise in the number of radiologists. When a novel imaging technology is introduced, it may be employed for indications for which there is little evidence of effectiveness or cost-effectiveness, resulting in the improper use of diagnostic imaging methods (Hadian et al., 2021).

In order to ensure that the public has access to affordable care, policymakers need to review past practices from other countries. Countries like Germany and Norway have enacted policies that help reduce out-of-pocket expenses and help reduce wasteful spending. By instituting caps on out-of-pocket expenses and full coverage for all preventative services, primary care, and effective treatments for chronic conditions, other top-performing nations have almost universally provided care for their citizens. In contrast to other nations, Germany abolished copays for doctor visits in 2013, while Norway's annual out-of-pocket health spending cap is about $300 USD (Schneider et al., 2021). Simply having insurance coverage that the public cannot access or is not affordable is not enough. For the public to have proper access to care, they need to be able to see their doctor when they need it. They need to be able to have access to affordable preventative care and coverage to see their primary doctor regularly. There needs to be transparency in the payment system and fewer incentives for physicians to order unnecessary tests that bring no diagnostic value.

The payment system is another important factor that has significantly contributed to the rise in the utilization of imaging technologies. In other words, payments are made to physicians, hospitals, and other healthcare providers to encourage them to offer more services. These payments are made regardless of whether or not the fee-for-service systems are cost-effective or the justifications for why they should exist. Procedures or visiting sessions are repaid for each test, and medical systems that lack integrity encourage the use of unnecessary tests and overdiagnosis
in fee-for-service systems. The importance of traits like these differs widely across the globe depending on the various organizational systems in use (Hadian et al., 2021).

All states adopting a bill like SB 1237 would help reduce the number of C.T. orders per year and the amount of radiation the public receives. If the bill were adopted in all 50 states, a universal dose tracking system would create a record anytime a patient goes outside their home state to receive a C.T. exam.
Economic Theories

Value-Based Radiology Services

Hadian et al. (2021) showed that adopting the radiation exposure reduction bill like bill SB1237 will help deal with rising healthcare expenditures. The concept of value-based healthcare would be beneficial if introduced. The goal of a value-based system is to enhance patients while lowering medical imaging costs. On the other hand, medical imaging is frequently regarded as a "cost" rather than a critical contribution to value. Imaging and other diagnostic investigations were recently classified as "low-value services" in an article published in the New England Journal of Medicine (Kwee et al., 2022). Meanwhile, radiologists are expected to provide value-based healthcare, but there are few financial incentives for providing value-based radiology services. On the other hand, the number of investigations completed continues to determine the amount of income. It is the most relevant parameter by which a radiology department's clinical success is judged and benchmarked (Hadian et al., 2021).

Adopting bill SB 1237 in all states will help standardize the accreditation process of all C.T. equipment and ensure that each piece of equipment is adequately surveyed and safety records are tracked. According to Hadian et al. (2021), Mandatory accreditation proposed from the bill SB1237 would help bring a solution to the problem of over radiation and establish the clinical decision support system. Many health insurance companies have utilized various imaging management systems, such as radiology benefit management (RBM). The focus of using an RBM system is to test cost and determine overall quality and guidelines to reduce radiation exposure successfully.
Many radiologists argue in the study that there is a high demand for imaging studies such as C.T. due to the expansion of medical probabilities and supply and demand services. This shows a significant need for a bill such as SB 1237 and adopting a decision support system that would help the ordering provider decide based on best practices and standards to help reduce the amount of C.T. ordered (Kwee et al., 2022).

**Supplier-Induced Demand**

Another economic theory that can be applied is the supplier-induced demand theory. This theory investigates physician behavior and justification for the need for the imaging study. In the study conducted by Sistrom et al. (2012) found that the physician characteristics that had a statistically significant impact on the likelihood of any imaging usage were years of experience, gender, the status of being a foreign medical graduate, and the possession of another graduate degree in addition to the M.D. Primary Care Providers who were female were 6 percent more likely than male PCP to use imaging, such as C.T. (Sistrom et al., 2012).

**COVID-19 Impact on Supplier-Induced Demand**

The COVID-19 pandemic impacted supplier-induced demand. COVID-19 has shown that C.T. can be used as a tool to diagnose the disease. This made C.T. of the chest the diagnostic imaging study of choice during the pandemic when the laboratory tests were unreliable and would take multiple days to get results. Increased use of C.T. during pandemic contributed to the supplied induced demand but has helped save many lives (Erxleben et al., 2021).

COVID-19 has also helped expand telehealth as a viable option to facilitate care delivery. This great alternative allowed patients to get care in the comfort of their homes and reduced the need for the patient to come into the hospital or clinic to be seen. This was very important because
of the social distancing that the government and CDC placed to reduce the spread of the infection. Telehealth has also increased imaging and other screening tests to aid diagnostic imaging. This trend has also contributed to the supplier-induced demand theory. Telemedicine considerably improved access to care but has increased demand in other areas. Medical Imaging was among the services that had a negative impact. Due to non-traditional physicians, physical evaluations are not possible through telemedicine. Physicians rely on diagnostic imaging studies more when evaluating the patient through telemedicine versus in-person. Telemedicine has impacted supplier-induced demand (Hardie et al., 2022).
Findings and Analysis

The utilization of C.T., MRI, and U.S. has grown since its discovery. The growth of C.T. utilization dramatically increased from the years 2000 and 2016. This review of the literature shows that there is no sign of utilization reduction. The results show that there will be a growth in C.T. utilization between 1-5% annually. This research found the relationship between the overutilization of computed tomography and excessive healthcare spending. The analyzed data suggested a direct relationship between overutilization and wasteful healthcare spending. The findings also suggested that most repeat C.T. exams brought little to no diagnostic value to the patient. It has also shown that the patient outcome and length of stay would not change based on the amount of C.T. patients received. The policy implications section of this study discussed the possible policy solutions to help reduce the overutilization of C.T. and healthcare spending. This research key findings include

1. Overutilization of C.T. negatively affects overall healthcare spending.
2. Overutilization increases radiation exposure and could negatively impact patient health outcomes.
3. Risk standardization and medical insurance standardization will help reduce the use of C.T. and become a significant benefit to the population.

The Impact of Overutilization of C.T. on Healthcare Spending:

The findings of this study also suggest that some of the more well-known reasons for higher U.S. health care spending, such as underinvestment in social programs, a low primary care/specialist mix, a fee-for-service system that promotes high volumes of care, or defensive medicine that leads to overutilization, did not appear to be significant drivers of the significantly
higher U.S. health care spending compared to other high-income countries. Instead, the
information reveals that the primary determining factors were those that affected patients' access
to care, such as the price of prescription drugs, hospital and medical facility services, and
diagnostic imaging procedures like CT scans. The findings show that, in addition to the
differential pricing for medical services and medications, prices for non-physician services and
procedures were significantly higher in the US. A Computed Tomographic exam costs
significantly more in the United States than in any other country, according to research cited in
Figure 1. The average cost of a computed tomography examination in the US in 2013 was $896.
This amount was significantly higher than the average costs in Canada ($97), the Netherlands
($279), Switzerland ($432), and Australia ($500), which were all on the average. Similar to how
an MRI costs an average of $1145 in the US, $350 in Australia, and $461 in the Netherlands, an
MRI costs an average of $461 in the US (Papanicolas et al., 2018).
Figure 1. Comparison of imaging studies performed in US vs other nations. (Papanicolas et al., 2018).

When reviewing Medicare reimbursement statements, Armao et al. (2011) analysis showed that the use of imaging studies has increased dramatically in comparison to other doctor-ordered exams. For instance, spending on medical imaging increased by more than twofold from $6.6 billion in 2000 to $13.7 billion in 2005, representing a growth rate that is twice that of services.
covered by physician fee schedules. One of the fastest-growing Medicare expenses is diagnostic imaging, and between 1999 and 2006, imaging costs for Medicare beneficiaries with cancer increased more quickly than the total costs for those beneficiaries. When compared to other healthcare technologies, like laboratory procedures and pharmaceuticals, the cost of diagnostic imaging services increased at a rate twice as fast in the last ten years (Armao et al., 2011).

**Increased Radiation Exposure from excessive CT use**

In 2008, there were almost 600,000 CT pulmonary angiographic studies performed in the US. Each examination for the studies is expensive, costing thousands of dollars. Young women who have pulmonary embolism symptoms and an excess estrogen state are frequently assessed using CT angiography (P.E.). According to a recent study, patients who underwent one CT angiogram (estimated dose, 12-32 mSv) for the purpose of evaluating their P.E. had an elevated relative risk of breast and lung cancer, with younger women being more susceptible. The lifetime attributable risk (LAR) for breast cancer for the P.E. protocol in 55-year-old women ranged from 20 excess cases per 100,000 to 503 excess cases per 100,000 in 15-year-old girls. A significant cohort of patients who underwent CT pulmonary angiography in 2003 for possible P.E. were retrospectively analyzed (Armao et al., 2011).

In a five-year retrospective study using information from the National Hospital Ambulatory Medical Care Survey, trends in the use of CT scans and significant diagnoses in emergency department patients with abdominal pain were examined (NHAMCS). The study discovered that neither the detection rates for appendicitis, diverticulitis, gallbladder disease, or hospital admissions changed with increased use of C.T. The prevalence of C.T. and MRI has increased by three times, according to a retrospective analysis of the use of advanced imaging for injury-related conditions over a ten-year period in U.S. emergency departments (Armao et al., 2011).
**Initiative to reduce the use of C.T.**

Many imaging procedures, such as C.T., Nuclear Medicine, and General Radiology that involve ionizing radiation to diagnose disease present benefits and risks to the patient. Normally, the benefit of the diagnostic study needs to outweigh the risk of the exam. Ultimately, providers, MDs, PAs, and Radiologists are the advocates and first line of people who make the judgment if the diagnostic imaging study is necessary. The risk of undergoing a diagnostic imaging procedure could be life-threatening. Physicians must consider those risks and justify the appropriateness of the exam when ordering the study. There are flaws in reporting the total radiation dose that the patient accumulates. Patients' medical imaging or radiation dose history may be unavailable to ordering physicians if different hospitals treat the patient. Due to a lack of history and information, physicians may order imaging procedures that have already been performed. Even though SB Bill 1237 makes it a standard to report each dose the patient received, this information is not readily available to physicians (Zucker et al., 2015).

According to the FDA (2019), there is an opportunity to reduce the number of C.T. orders if the provider has the necessary information or recommended guidelines. A recommendation by the FDA is to look at appropriateness or appropriate use criteria associated with the patient's condition to determine if the exam is medically necessary. The study by Taylor et al. (2018) compared imaging orders from centers that had adopted imaging orders practice by using the risk-standardization model. The model used machine learning algorithms and a random forest model to predict the probability of a patient undergoing a C.T. exam based on encounter-level data for each indication. The comparison was made with another medical center that did not use the risk-standardization model. Each cohort had between 70 and 88 attending physicians who ordered more than 25 C.T. studies for a particular indication, and each cohort had between 17,458 and 117,489
visits to the emergency department. C.T. usage during the patient's visit to the emergency department increased by 20% in medical facilities that did not use a risk-standardized model before ordering the test (Taylor et al., 2018).

CMS (2014) enacted "The Protecting Access to Medicare Act (PAMA) of 2014, section 218(b)", which would help ensure the appropriate diagnostic imaging services are being provided to Medicare beneficiaries. This program would require that all ordering providers and practitioners would be required to access will be required to consult a qualified Clinical Decision Support Mechanism (CDSM) which is an electronic portal that would help access appropriate use criteria (AUC); (CMS, 2014). Providers ordering advanced medical imaging examinations would check acceptable use criteria (AUC). Consultation would be performed live before the physician places an imaging order, and the clinical history would be reviewed for appropriateness. Although PAMA intended for the AUC program to go into effect on January 1st, 2017, many regulatory delays have been imposed throughout the years, with full implementation now set to commence on January 1st, 2023 (CMS, 2014). These would help ensure that the diagnostic imaging study is appropriate but poses some concerns for patients who are in a critical situation and need an imaging study immediately.
Limitations

This research relied on qualitative research methods because of the questions that were asked and the subject matter that was being investigated. Although the data from the archives were examined in great detail, this particular study did not involve any primary research. Another shortcoming of the research is that it is difficult to provide conclusive evidence that one factor caused another. Because peer-review journals publish a variety of data and findings on topics such as radiation exposure, excessive use of computed tomography, and the cost of medical care, it is more difficult to identify recurring themes. Due to the lack of peer-reviewed articles on CT Utilization and medical cost from overexposure, data from outside of California was also used in this study. The majority of the academic articles that were used for this investigation drew their conclusions from interviews, surveys, and previous database research. During this research, some of the limitations discovered were the actual reporting of the radiation dose, the number of Imaging studies performed by the state, and the gaps in the reporting guidelines. The reporting dose is limited because not every state has a bill enacted to enforce the reporting of radiation exposure. The limitation of data that would show the number of imaging studies performed by each state would determine if the bill on radiation exposure is beneficial and show what state would benefit from the bill the most. There is substantial evidence that reducing C.T. imaging would help reduce the overall cost of medicine. However, there is a lack of research on value-based imaging implementation in the hospital and an actual reduction of imaging studies compared to hospitals that would not utilize value-based imaging.
Recommendation for Future Research

There is limited research on the over-utilization impact on increased medical costs. Most peer-reviewed articles analyze overall medical cost but not many looks at the drivers of the cost. More data on the ways in which the excessive use of C.T. is affecting healthcare access, medical waste, and costs in California will be beneficial to the research that will be conducted in the future. Incorporating new data derived from pilot programs established as a result of the passage of Bill SB 1237 is yet another recommendation. The process of developing new policies to address the overuse of CT scans and the rising medical costs that are a direct result of this overuse would benefit from these data. Additional analysis on the drawbacks of taking this approach to public policy could be provided as more research is done to determine whether it is possible for FDA policy to standardize risk assessment initiatives. Reducing the rewards given to doctors and radiologists for performing repeated and unnecessary exams is another suggestion. This model has been adopted by many other nations, which has significantly reduced the use of unnecessary imaging. A thorough evaluation of CMS's new guidance and its implications for addressing the rising medical costs brought on by an excessive use of CT scans would be beneficial for future research as well.
Conclusion

This study reaffirmed that over-utilization of C.T. contributes to the rising cost of medicine. Physicians hold a compelling and significant authority over patients who are in pain. Patients look to physicians and think that they would not intentionally harm them. Imaging studies have evolved since the discovery and now help determine the diagnoses and course of treatment for any disease. Radiation exposure has been on the rise and is the most significant exposure to the public from radiation. Overuse and misuse of C.T. can create many ethical dilemmas contributing to unnecessary radiation exposure and high healthcare costs. There could be a significant reduction in excessive radiation exposure by educating physicians, staff, and patients. Radiologists and ordering physicians must work together to ensure that the C.T. exam is necessary and outweighs the risk of possible radiation damage. California passed a bill to ensure that all C.T. doses are tracked and maintained. Physicians take an oath not to harm; this message can be lost when so many litigations arise from potential misdiagnoses. It is essential to ensure that when a radiation-induced exam, like a C.T., is ordered, it is appropriate and will help the patient's overall treatment. Measures like SB 1237 could help reduce radiation exposure to the patient and place preventative measures to ensure that cumulative dose is tracked. Placing caps on out-of-pocket services, promoting preventative services, and ensuring the public access to quality healthcare can help reduce healthcare spending. Standardizing orders and having physicians work closely with radiologists before imaging exams are ordered would reduce waste in over-utilizing imaging studies that comprise 25% of all healthcare spending.
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