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Research Article

Impact of California Computed Tomography Dose Legislation: Survey of Radiologists

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ABSTRACT

Introduction: Highly publicized accounts of radiation overdose from computed tomography (CT) in both children and adults prompted legislation in California regulating CT dose. The purpose of this study was to determine the impact of the law (codified in Senate Bill [SB] 1237) on California radiologist practice patterns and understanding of CT dose.

Materials and Methods: All radiologist members of the California Radiological Society were surveyed in August–September 2013. Questions gauged radiologists' familiarity with and attitudes toward the law, awareness of CT dose, and changes in practice following the law's enactment.

Results: Of 1,300 surveyed, 138 (11%) responded; 132 of 137 (96%) were familiar with SB 1237. Of 135 responding, 126 and 115 (93% and 85%, respectively) knew to report CT dose index volume and dose-length product. Sixty of 134 (45%) attributed dose reporting to an increased awareness of appropriate dose ranges. Twenty-nine of 133 (22%) had modified protocols in concert with SB 1237s enactment. Of 31 responding, 5 (16%), 23 (74%), and 3 (74%) had modified protocols in only children, both adults and children, and only adults, respectively. Twenty-four of 129 (19%) utilized automated dose reporting; 48 (37%) and 57 (44%) used dictation/transcription and template-assisted voice recognition, respectively. Forty of 134 (30%) noted delays finalizing CT reports.

Conclusions: Most radiologists who responded in our sample were familiar with SB 1237. Nearly half attributed dose reporting to an increased awareness of appropriate dose ranges. Almost one quarter indicated protocol modifications, the majority including children, occurring in conjunction with the law. Reporting inefficiency was a common concern.

RÉSUMÉ

Introduction : Des récits hautement publicisés de surdose de radiation en tomodensitométrie (TDM) chez des enfants et des adultes ont incité l'État de la Californie à légiférer pour réglementer les doses de rayonnement en TDM. La présente étude vise à déterminer l'incidence de la loi (codifiée dans le projet de loi du Sénat [SB] 1237) sur les modèles de pratique des radiologistes californiens et la compréhension des doses en TDM.

Matériel et méthodologie : Un sondage a été mené auprès de tous les radiologistes membres de la California Radiological Society (CRS) en août et septembre 2013. Les questions mesuraient la es connaissances et l'attitude des radiologistes face à la loi, la sensibilisation aux doses en TDM et les changements apportés à la pratique après l'adoption de la loi.

Résultats : Parmi les 1 300 radiologistes ayant reçu le questionnaire, 138 (11%) ont répondu; 132 sur 137 (96%) connaissaient SB 1237. Parmi les 135 répondants, 126 et 115 (93% et 85%, respectivement) savaient qu'ils devaient faire rapport des indices de volume de dose en TDM (CTDIvol) et du produit de dose-durée (DLP). Soixante des 134 répondants (45%) ont associé les rapports de dose à une plus grande sensibilisation aux plages de dose appropriées. Vingt-neuf répondants sur 133 (22%) ont modifié leurs protocoles à la suite de l'entrée en vigueur de SB 1237. Sur 31 répondants, 5 (16%), 23 (74%), et 3 (14%) ont modifié les protocoles respectivement pour les enfants seulement, pour les enfants et les adultes ou pour les adultes seulement, respectivement. Vingt-quatre répondants sur 129 (19%) utilisent les rapports de dosage automatiques; 48 (37%) et 57 (44%) utilisent la dictée/transcription et la reconnaissance vocale assistée par des modèles, respectivement. Quarante répondants sur 134 (30%) ont noté des délais dans la préparation des rapports de TDM.

Conclusions : 11% des radiologistes de notre échantillon étaient familiers avec SB 1237. Près de la moitié ont associé les rapports de dose à une plus grande sensibilisation aux plages de dose

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Conflict of interest: The authors have no conflicts of interest to disclose.

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appropriées. Près du quats ont signalé des modifications de protocoles, la majorité concernant les enfants, en association avec l'entrée en vigueur de la loi. L'inefficacité du processus de rapport est une préoccupation commune.

Keywords: California; CT; Radiation dose; Dose reporting; Senate Bill 1237

Introduction

In California's recent past, there were a number of highly publicized accounts of egregious radiation overdose arising from diagnostic computed tomography (CT). The first reported incident involved a 53-year-old man who underwent CT brain perfusion imaging at Cedars-Sinai Hospital in Los Angeles, CA. Several weeks after the scan, he developed a band of hair loss and was found to have received up to eight times the anticipated dose [1]. By 2010, according to public media, at least 400 such cases of excessive CT radiation dose had been documented involving eight hospitals, six in California [2–5]. These incidents included the infamous case of a 2½-year-old boy who presented to a California community hospital with neck pain and was allegedly scanned 151 times in the same area [2].

Such events provided the impetus for California's 2010 passage of Senate Bill (SB) 1237, the first legislation of its kind regulating diagnostic CT radiation dose. The law has three major components: (1) a set of reportable CT events (unwarranted repeat scanning, wrong-site scanning, etc. while exceeding predefined dose limits); (2) CT dose reporting requirements; and (3) CT scanner accreditation requirements. The first two components became effective on July 1, 2012, while the third component became effective on July 1, 2013. Dose reporting requirements mandate that CT dose index volume ($CTDI_{vol}$) and dose-length product (DLP) be indicated directly in the radiology report whenever available from the CT scanner. Alternatively, the protocol page may be attached to the report or a dose unit approved by the American Association of Physicists in Medicine may be used [6].

SB 1237 was intended to prevent future incidents of radiation overdose resulting from diagnostic CT [7]. However, the actual effects of the law are unclear. In particular, the impact of dose reporting requirements on practice patterns of radiologists, who are ultimately responsible for the contents of the radiology report, is not known. The purpose of this survey study was to determine whether SB 1237 has influenced California radiologists' understanding of CT dose and prompted efforts at CT dose optimization. The survey also assessed the impact of SB 1237 on radiologist workflow. To our knowledge, this type of data is not readily available from such agencies as the California Department of Public Health or the Joint Commission.

Materials and Methods

Institutional review board submission was not required for this anonymous survey study of professional society members. The study was performed in accordance with the ethical principles of the Declaration of Helsinki.

A 13-question survey (Appendix S1) was constructed using the online survey creation website SurveyMonkey.com (SurveyMonkey, Palo Alto, CA). Initial survey questions were designed to assess basic practice characteristics and responding radiologists' familiarity with SB 1237 and its dose reporting requirements. Subsequent questions addressed practice adaptations to accommodate dose reporting and potential concerns about the new requirements. The last series of questions sought to gauge whether radiologists attributed to the law greater awareness of CT dose issues and/or CT protocol modification efforts to optimize dose. Most questions were presented in yes-or-no or multiple choice format. The final question allowed respondents to provide free text comments about the effects of SB 1237 on their radiology practice. Questions 4 and 12 were intended to be answered only if the respondent had indicated "yes" to the question immediately prior (questions 3 and 11, respectively); however, the online survey did not prohibit others from potentially responding.

The survey was administered by the California Radiological Society (CRS) via the electronic mailing list of all radiologist members of the CRS on August 27, 2013. Recipients received an e-mail indicating the objectives of the study and could elect to participate by following the embedded link to the SurveyMonkey website. The survey was available through September 17, 2013. All responses were anonymous and data recorded only in aggregate. No incentive or penalty was presented for participating or declining to participate. There was no mandatory or minimum number of responses required by radiologists participating in the survey.

Data were collected through the SurveyMonkey website and exported to Microsoft Excel (Microsoft Corporation, Redmond, WA) for analysis. For every yes-or-no or multiple choice question, the number and percentage of respondents selecting each answer option were recorded. Percentages were rounded to the nearest whole number for values ≥ 1. The denominator for each response reflected the number of survey participants answering a particular question. Free text responses to the final survey question were recorded in a separate Microsoft Word (Microsoft Corporation, Redmond, WA) file.

Results

The survey was e-mailed anonymously to the CRS radiologist distribution list comprised of 1,300 members. One hundred thirty-eight individuals responded to the survey, for a response rate of 11%.