The Journal of Emergency Medicine, Vol. 49, No. 3, pp. 268–273, 2015

0736-4679/$ - see front matter

ELSEVIER

http://dx.doi.org/10.1016/j.jemermed.2015.02.009

Original Contributions

SENSITIVITY AND SPECIFICITY OF EMERGENCY PHYSICIANS AND TRAINEES FOR IDENTIFYING INTERNALLY CONCEALED DRUG PACKAGES ON ABDOMINAL COMPUTED TOMOGRAPHY SCAN: DO LUNG WINDOWS IMPROVE ACCURACY?

Stephen Edward Asha, BSC, MBBS, FACEM, MMED(CLIN EPI)*† and Andrew Cooke, MBBS, DCH, LLB, LLM*

*Emergency Department, St George Hospital, Kogarah, New South Wales, Australia and †Faculty of Medicine, University of New South Wales, Kensington, New South Wales, Australia

Reprint Address: Stephen Edward Asha, BSC, MBBS, FACEM, MMED(CLIN EPI), Emergency Department, St George Hospital, Gray St, Kogarah, NSW 2217, Australia

□ **Abstract—Background: Suspected body packers may be brought to emergency departments (EDs) close to international airports for abdominal computed tomography (CT) scanning. Senior emergency clinicians may be asked to interpret these CT scans. Missing concealed drug packages have important clinical and forensic implications. The accuracy of emergency clinician interpretation of abdominal CT scans for concealed drugs is not known. Limited evidence suggests that accuracy for identification of concealed packages can be increased by viewing CT images on "lung window" settings. Objectives: To determine the accuracy of senior emergency clinicians in interpreting abdominal CT scans for concealed drugs, and to determine if this accuracy was improved by viewing scans on both abdominal and lung window settings. Methods: Emergency clinicians blinded to all patient identifiers and the radiology report interpreted CT scans of suspected body packers using standard abdominal window settings and then with the addition of lung window settings. The reference standard was the radiologist's report. Results: Fifty-five emergency clinicians reported 235 CT scans. The sensitivity, specificity, and accuracy of interpretation using abdominal windows was 89.9% (95% confidence interval [CI] 83.0–94.7), 81.9% (95% CI 73.7–88.4), and 86.0% (95% CI 81.5–90.4), respectively, and with both window settings was 94.1% (95% CI 88.3–97.6), 76.7% (95% CI 68.0–84.1), 85.5% (95% CI 81.0–90.0), respectively. Diagnostic accuracy was similar regardless of the clinician's experience. Interrater reliability was moderate (kappa 0.46). Conclusion: The accuracy of interpretation of abdominal CT scans performed for the purpose of detecting concealed drug packages by emergency clinicians is not high enough to safely discharge these patients from the ED. The use of lung windows improved sensitivity, but at the expense of specificity.** Crown Copyright © 2015 Published by Elsevier Inc.

□ **Keywords—computed tomography; X-ray; sensitivity and specificity; foreign bodies; street drugs; emergency medicine**

INTRODUCTION

Illicit drugs are smuggled through international airports by so called "body packers" who conceal drugs within their body while passing through airport security. Suspected body packers may be brought to emergency departments (EDs) for imaging studies to detect these packages (Figure 1). A range of imaging modalities are used, including X-ray study, ultrasound, and computed tomography (CT) (1). Abdominal CT is reported as having the highest sensitivity (2,3).

In keeping with published protocols, it is our practice to obtain a noncontrast CT abdomen (4). These scans are often interpreted by an emergency consultant or registrar,

RECEIVED: 11 August 2014; FINAL SUBMISSION RECEIVED: 18 December 2014;
ACCEPTED: 17 February 2015

Figure 1. Coronal noncontrast computed tomography image demonstrating multiple drug packages.

especially outside of "business hours," when the radiologist report is not immediately available. Management decisions are made on this interpretation, including those of the police to release a suspect.

It is important that no concealed drugs remain in the person once they are discharged, due to the forensic implications and because packages can rupture, releasing lethal doses of drug into the body (5–8). It would be of value to know the accuracy with which emergency clinicians interpret CT scans, as there is currently no literature available. It has been suggested, based on limited evidence, that sensitivity for the identification of concealed packages can be increased by viewing CT images on both the standard abdominal windows and lung window settings (1,9,10) (Figure 2).

Our aim was to determine the accuracy of emergency clinician interpretation of abdominal CT scans for concealed drugs, and to determine if this accuracy was improved by viewing scans on both abdominal and lung window settings.

METHODS

Study Setting

We conducted this cross-sectional analytic study in the ED of a tertiary referral center located in Sydney, Australia between February and May 2014. Permission for the study was granted by the South Eastern Sydney Local Health District (Northern Sector) Human Research Ethics Committee.

Selection of Participants

We invited emergency consultants and registrars employed at the study hospital to take part in the study.

Measurements

We selected 30 consecutive positive and 30 consecutive negative scans of patients suspected of concealing drugs who presented between October 2010 and July 2013, and removed all identifying information from the images. Each participating clinician reported five abdominal CT scans. All images normally provided in clinical practice were available for viewing, with the exception of three-dimensional reconstructions.

The scans were rearranged randomly according to a computer-generated random number sequence and then numbered 1 to 60. The five scans to be viewed by each participant were selected sequentially from this list. This was done to create a random ratio of positive-to-negative scans viewed by an individual participant. Participants were informed of this process to prevent guessing the result of future scans based on the interpretation of scans already looked at. Each scan was first viewed on the standard "abdominal" window setting (level 40, width 400) and reported as negative or positive for concealed packages. The viewing window was then changed to "lung" window settings (level −500, width 1600), and a second interpretation recorded.

We used the radiologist's report as the Reference standard. Participants were blinded to this report. Other data collected related to the experience of the participant: consultant or registrar, and a self-reported estimate of the number of CT scans of patients suspected of drug concealment personally reviewed during their clinical practice.

Our primary outcome was the accuracy of emergency clinician interpretation of CT scans for the presence of concealed drug packages.

Analysis

We calculated sensitivity, specificity, overall accuracy, and positive and negative likelihood ratios with 95% confidence intervals. Interrater reliability was determined using Cohen's kappa statistic.

We determined diagnostic accuracy using abdominal windows only and when viewing both abdominal and lung windows together; for trainees vs. consultants; and according to experience in reading concealment CT