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CT scan incidental findings in trauma patients: does it impact hospital length of stay?

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ABSTRACT

Background CT scans are heavily relied on for assessment of solid organ injuries complementing clinical examination. These CT scans could also reveal pathologies not related to trauma called incidental findings. We aimed to evaluate the frequency of these findings and their outcome on hospital services.

Methods A retrospective chart review of prospectively collected data of the emergency department's trauma database from January 2005 to December 2011 to evaluate incidental findings on CT scans on trauma admissions. These incidental findings were divided into three classes: class 1—minor degenerative, non-degenerative, normal variants or congenital finding that does not require further investigation or workup; class 2—findings not requiring urgent intervention with scheduled outpatient follow-up and class 3—all findings that require urgent evaluation/further investigation during the same hospital admission. One-year follow-up was done to review hospital length of stay, trauma clinic follow-up and post-trauma surgery.

Results Of 1000 charts reviewed, 957 were selected after 43 patients were excluded due to incomplete documentation. Of the 957 patients, 385 (40%) were found to have incidental findings. A total of 560 incidental findings were found on the CT scan reports with one-third of patients having multiple findings (144 patients, 37.4%). The largest number of incidental findings were in class 2. The incidental group had significantly longer length of stay after adjusted multivariate analysis (8.7±0.48 vs 6.7±0.55, p=0.005).

Conclusion The incidental findings are commonly found during CT imaging in trauma centers and our rate was 40%. Appropriate documentation, communication and follow-up of those findings is necessary. A classification system for these findings practiced nationwide will aid in categorizing the urgency of continued follow-up. This also will help decrease the length of hospital stay and healthcare cost.

Level of evidence Level 4

INTRODUCTION

Except for cardiac events and cancer, trauma remains one of the leading causes of morbidity and mortality in the USA. Based on the US Census Bureau, in 2009 there were 10.8 million accidents leading to over 35 900 deaths.[1] Trauma is still the leading cause of death among teenagers and a major cause of morbidity and mortality among the elderly, which is a growing area of concern.[2] The modern trauma centers rely heavily on CT scans for assessment of solid organ injuries. Besides providing information on acute trauma-related injuries, CT scans could also reveal pathologies not related to trauma called 'incidental findings', which may or may not require further investigation.[3–6]

The diagnosis and correct treatment of these incidental findings could have an impact on patient's future health. The frequency of incidental findings varies from institution to institution[4 7 8] as it depends on patient population, volume of trauma, type of trauma and resources available at the trauma center. The number of incidental findings based on previous published articles has been variable from 30% to as high as 53%.[9–14] The aim of this study is to determine the frequency of incidental findings in a level 1 trauma center, hospital length of stay, any intervention performed during or after the admission and 1-year follow-up. The incidental findings will allow for development of a classification system that can be applied to these findings, which will help in their management, improve patient awareness and follow-up.

METHODS

Study design

We performed a retrospective chart review of all patients who were admitted with a trauma diagnosis from a prospectively maintained New York State Trauma Registry emergency department database between January 2005 and December 2011. Data were collected from electronic medical records with inclusion criteria being all patients who received a CT scan of the head, cervical spine, chest, abdomen and pelvis and/or total body scan that were admitted to the trauma service. Any patient who did not have a CT scan was excluded. The CT scans were reviewed for any type of incidental finding noted on the definitive radiology report. The course of in-hospital stay was reviewed for demographics, past medical history (smoking history, cardiopulmonary disease, history of cancer, any surgical intervention), trauma type (blunt, penetrating), trauma classification (fall, motor vehicle accident (MVA), pedestrian, assault, gunshot wound, stab, other), number of body part involved, injury severity score (ISS), length of stay and discharge disposition. Fall category comprised of all patients with the admitting diagnostic category as fall in the New York Trauma registry. In trauma classification, the 'other' category was defined as home accidents, foreign body injuries or blast injury.

The primary outcomes were to determine the frequency of incidental findings in our patient population and hospital length of stay. The secondary

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outcomes were chart review of 1-year follow-up of patients with inpatient and outpatient clinics with any incidental finding intervention (ie, pathology report, radiology scans, surgical intervention), 1-year mortality and intensive care unit (ICU) admission.

One thousand charts were reviewed based on the inclusion/exclusion criteria. Data were collected on the number of incidental findings reported by board certified radiologists on CT scans. An incidental finding was defined as an abnormal finding not related to trauma seen in CT scan imaging.[12] The incidental findings were further classified into three classes based on classification used in the literature[7 9 12–15]:

Class 1: includes minor degenerative, non-degenerative, normal variants or a congenital finding that does not require further investigation or workup.

Class 2: includes finding that did not require urgent intervention. However, an outpatient follow-up within 3 months to 1 year is necessary.

Class 3: includes all findings that require urgent evaluation or further investigation before hospital discharge or soon after discharge.

For each incidental finding, we reviewed currently available guidelines and articles to determine the recommended management and clinical importance of the incidental findings.[12 16–19]

Statistical analysis

Summary statistics for demographic and baseline clinical characteristics are presented for all patients. Categorical data are summarized using frequency counts and percentages. Descriptive statistics summarize continuous variables, including mean and SD.

Comparisons were made between the incidental and non-incidental groups. To identify potential confounding factors, initial univariate analyses were conducted for all the demographic and clinical variables comparing incidental and non-incidental groups. For categorical variables, comparisons were made using a χ^2 test or Fisher's exact test as appropriate. For continuous variables, comparisons were made using an independent groups t-test, or a Wilcoxon-Mann-Whitney U test for skewed variables.

Multivariate models for each of the outcomes (length of stay, 1-year mortality and ICU admission) were developed to adjust for the potential confounding effect of demographic and clinical risk factors. Among the many potential confounding factors, age >65 years, prior surgery, history of cardiopulmonary and ISS were selected to be included in the multivariate analyses based on unadjusted p values of the univariate tests ($p<0.05$) and on clinical considerations.

All statistical tests were two-sided, and there was no adjustment for multiple testing. A p value of <0.05 was considered to indicate statistical significance. All the data analyses were performed using SAS (Statistical Analysis System) software V.9.3.

RESULT

One thousand charts were reviewed and 957 were selected. Forty-three charts were excluded due to incomplete documentation. Out of those 957, 385 patients (40%) were found to have incidental findings. A total of 560 incidental findings were found on CT scan reports and, of these, more than one-third of the patients had multiple incidental findings (144 patients, 37%). Table 1 lists the baseline patient characteristics and inpatient outcomes for overall group and subgroups of incidental and non-incidental findings. The mean age of all patients was 54.3±27.6 years; the age for patients with incidental findings was much higher compared with patients without, 62.0±22.3

Table 1 Baseline characteristics and trauma-related outcomes

	Overall	Positive findings	Negative findings	p Value
	n=957	n=385	n=572	
Characteristics				
Age (years)	54.3±27.6	62.0±22.3	49.2±29.5	0.0001
Median (range)	58 (<1–100)	66.3 (<1–98)	47 (<1–98)	
Elderly, ≥65 years	424 (44.3)	204 (53.0)	220 (38.5)	
Gender				0.2828
Male	572 (59.8)	222 (57.7)	350 (61.2)	
Female	385 (40.2)	163 (42.3)	222 (38.8)	
Caucasian, race	816 (85.3)	335 (87.0)	481 (84.1)	0.2273
Body mass index, kg/m^2	25.9±6.6	26.6±9.4	26.2±8.8	0.5948
Current smoker	331 (34.6)	136 (35.3)	195 (34.1)	0.7291
Cardiopulmonary disease	490 (51.2)	224 (58.2)	266 (46.5)	0.0005
Diabetes	55 (5.7)	24 (6.2)	31 (5.4)	0.6713
Hypertension	147 (15.4)	60 (15.6)	87 (15.2)	0.9272
Coronary artery disease	34 (3.6)	19 (4.9)	15 (2.6)	0.0740
Pulmonary disease	20 (2.1)	10 (2.6)	10 (1.7)	0.3681
Alcoholism	14 (1.5)	8 (2.1)	6 (1)	0.2717
History of cancer	85 (8.9)	32 (8.3)	53 (9.3)	0.6445
History of prior surgery	443 (46.3)	200 (51.9)	243 (42.5)	0.0045
Trauma classification				
Fall	551 (57.6)	238 (61.8)	313 (54.7)	0.0328
Motor vehicle accident	217 (22.7)	99 (25.7)	118 (20.6)	0.0704
Pedestrian	55 (5.7)	22 (5.7)	33 (5.8)	NS
Assault	56 (5.9)	16 (4.2)	40 (7.0)	0.0693
Gunshot wound	8 (0.8)	1 (0.3)	7 (1.2)	0.1535
Stab	11 (1.1)	0	11 (1.9)	0.0041
Other	59 (6.2)	9 (2.3)	50 (8.7)	NS
Trauma type				0.0124
Blunt	919 (96.0)	378 (98.2)	541 (94.6)	
Penetrating	24 (2.5)	3 (0.8)	21 (3.7)	
Other	14 (1.5)	4 (1)	10 (1.7)	
Injury severity score	13.5±7.7	14.2±7.8	13.1±7.7	0.0325
Median (range)	10 (1–66)	13 (1–50)	10 (1–66)	
No. of CT scans				
Head	813 (85.0)	355 (92.2)	458 (80.1)	0.0001
Chest	390 (40.8)	240 (62.3)	150 (26.2)	0.0001
Abdomen and pelvis	617 (64.5)	356 (92.5)	261 (45.6)	0.0001
All of the above	336 (35.1)	212 (55.1)	124 (21.7)	0.0001
ICU admission required	268 (28.0)	133 (34.5)	135 (23.6)	0.0002
Hospital length of stay	7.3±10.1	8.7±12.8	6.4±7.7	0.0012
Median (range)	5 (1–175)	6 (1–175)	4 (1–96)	
Discharge disposition				<0.0001
Home	540 (56.4)	187 (48.6)	353 (61.7)	
Rehab unit	191 (20.0)	94 (24.4)	97 (17.0)	

Continued

Table 1 Continued

	Overall	Positive findings	Negative findings	p Value
Death	67 (7.0)	37 (9.6)	30 (5.2)	
Skilled nursing facility	59 (6.2)	30 (7.8)	29 (5.1)	
Against medical advice	15 (1.6)	7 (1.8)	8 (1.4)	
Psychiatric unit	3 (0.3)	3 (0.8)	0	
Other	82 (8.6)	27 (7.0)	55 (9.6)	

Values are given as mean±SD with median and range for continuous, or n (%) for categorical.
ICU, intensive care unit; NS, no significance.

years vs 49.2±29.5 years (p=0.0001), respectively. Patients aged >65 years totaled 44% of the study population and were found to have a significant number of incidental findings (53% vs 39%, p=0.0001). Of patient risk factors, cardiopulmonary disease was found in 51% of the overall study group, with a significantly higher number of incidental findings found in patients with cardiopulmonary disease than those without (58% vs 47%, p=0.0005). History of prior surgery was also significantly higher in patients with incidental findings when compared with those without (52% vs 43%, p=0.0045).

In trauma classifications, falls were most common (58%) followed by MVA (23%), assault (6%), pedestrian accident (6%) and others. Falls were proportionally greater in the incidental group (62% vs 55%). The overall mean ISS was 13.5±7.7. Between the groups, the mean ISS was higher in the incidental group by one point compared with the non-incidental group with significance (14.2±7.8 vs .13.1±7.7, p=0.0325).

The number of CT scans patients received were quantified and separated between the two groups. A total of 1820 CT scans of the head, chest and abdomen/pelvis were performed and reviewed. The number of scans between groups is shown in table 1. A high number of scans for the head, chest and abdomen/pelvis had incidental findings (92%, 62% and 96%, respectively) compared with non-incidental group (80%, 26% and 46%, respectively); each group comparison was highly significant (p<0.0001). A total of 337 findings (67% of all incidental findings) were identified on CT scans of the abdomen and pelvis, the most of all CT scans performed. The least number of incidental findings were identified on CT scans of the head (28 findings, 5%).

ICU admission was required for 28% of patients: incidental group 133 (35%) and non-incidental group 135 (24%) (p=0.0002). Overall hospital length of stay was 7.3±10.1 days, with 8.7±12.8 days taken by the incidental group to be discharged and 6.4±7.7 days by the non-incidental group (p=0.0012).

Table 2 lists all incidental findings reported in the CT scan reports. The findings are categorized by classes defined above: class 1—51 (9%); class 2—354 (63%) and class 3—155 (28%). The highest number of findings were in class 2 classification (did not require urgent intervention) followed by class 3 (findings requiring urgent evaluation) and class 1 (normal variants). Class 1 lesions were 51 (9%) of our incidental findings. Class 2 included all adrenal and thyroid nodules, pleural and lung nodules and all types of cysts affecting kidneys and liver which do not require immediate or urgent intervention, but do require an appropriate follow-up. A total of 354 findings were defined as class 2 (63%) and 155 findings were defined as class 3 (28%). The most common incidental findings were found in kidneys

Table 2 Incidental finding by classification

Total incidental findings	560
Class 1	51 (9.1)
Sinus—polyp/cyst	17 (3)
Bladder diverticulum	7 (1.3)
Duodenal diverticulum	5 (0.9)
Duplicate renal system	4 (0.7)
Vertebral body	
Hemangioma	4 (0.7)
Accessory spleen	3 (0.5)
Horse shoe kidney	3 (0.5)
Bovine aortic arch	3 (0.5)
Left-sided superior vena cava	2 (0.4)
Adrenal mylolipoma	2 (0.4)
Undescended testicle	1 (0.2)
Class 2	354 (63.2)
Renal	104 (18.6)
Kidney cyst	91
Stone	13
Lung nodule	70 (13)
Thyroid nodule	39 (7)
Adrenal nodule	36 (6.4)
Ovarian cyst	20 (3.6)
Hepatic cyst	19 (3.4)
Spleen	14 (2.5)
Hemangiomas	13
Cyst	1
Hiatal hernia	10 (1.8)
Hernia	8 (1.4)
Inguinal	6
Umbilical	2
Dilated intrahepatic ducts	5 (0.9)
Uterine fibroid	5 (0.9)
Prostate enlargement	4 (0.7)
Gall stones	4 (0.7)
Skin lesions (lipoma)	4 (0.7)
Arachnoid cyst	3 (0.5)
Hydrocele	3 (0.5)
Diaphragmatic hernia	2 (0.4)
Pleural nodule	2 (0.4)
Splenomegaly	1 (0.2)
Small bowel lesion (lipoma)	1 (0.2)
Class 3	155 (27.7)
Kidney hypodense lesions	36 (6.4)
Liver hypodense lesions	30 (5.4)
Pancreatic mass type	30 (5.4)
Hypodense lesions	15
Cyst	5
Mediastinal lymph node	14 (2.5)
Brain lesion	11 (2)
Abdominal aortic	
Aneurysm	11 (2)
Lung mass	6 (1.1)
Breast	5 (0.9)

Continued

Table 2 Continued

Total incidental findings	560
Iliac artery aneurysm	3 (0.5)
Endometrial	3 (0.5)
Thickening	1
Mass	2
Mediastinal	3 (0.5)
Cyst	1
Mass	2
Colon lesion	2 (0.4)
Suspicious lymph node	2 (0.4)
Pelvic mass	2 (0.4)
Stomach mass	1 (0.2)
Subclavian artery aneurysm	1 (0.2)
Renal artery aneurysm	1 (0.2)
Vertebral artery aneurysm	1 (0.2)
Mesenteric mass	1 (0.2)
Bladder mass	1 (0.2)
Basal ganglia mass	1 (0.2)

Data are presented as N (%) of the total and n (%) of the class findings.

(25% of all incidental findings and 42% of the abdomen and pelvic CT scan findings). The second most common organ with incidental findings was lung with 76 incidental findings (14%).

Table 3 Subgroup classification of the incidental group

	Class 1	Class 2	Class 3	p Value
N	53	207	125	
Age (years)	45.3±27.3	62.3±20.7	68.4±18.8	<0.0001
Elderly, ≥65 years	19 (35.8)	108 (52.2)	77 (61.6)	0.0067
Injury severity score	15.2±9.6	15.4±8.7	14.5±10.9	0.2144
Trauma classification				0.3015
Fall	24 (45.3)	126 (60.9)	88 (70.4)	
Motor vehicle accident	20 (37.7)	55 (26.6)	24 (19.2)	
Pedestrian	2 (3.8)	5 (2.4)	2 (1.6)	
Assault	4 (7.5)	10 (4.8)	2 (1.6)	
Gunshot wound	0	1 (0.5)	0	
Stab	3 (5.7)	10 (4.8)	9 (7.2)	
Trauma type				0.165
Blunt	50 (94.3)	204 (98.6)	124 (99.2)	
Penetrating	1 (1.9)	2 (1)	0	
Other	2 (3.8)	1 (0.48)	1 (0.8)	
Discharge disposition				0.9449
Home	31 (58.5)	101 (48.8)	55 (44)	
Rehab unit	13 (24.5)	47 (22.7)	34 (27.2)	
Death	5 (9.4)	18 (8.7)	14 (11.2)	
Skilled nursing facility	2 (3.8)	18 (8.7)	10 (8)	
Against medical advice	0 (0)	4 (1.9)	3 (2.4)	
Psychiatric unit	1 (1.9)	1 (0.48)	1 (0.8)	
Other	1 (1.9)	18 (8.7)	8 (6.4)	
ICU admission required	20 (37.7)	69 (33.3)	40 (32)	0.7574
Hospital length of stay	7.2±6.9	9.0±11	9.8±17	0.1206

Categorical data are presented as number (%) and continuous data as mean±SD.
ICU, intensive care unit.

Table 4 Multivariate and OR analysis of length of stay, mortality and ICU admission

	Outcomes	p Value
Length of stay (least square mean)		
Incidental findings	8.7±0.48	0.005
Non-incidental findings	6.7±0.55	
Mortality		
OR (no vs yes)	0.77 (0.53, 1.11)	0.164
ICU admission		
OR (no vs yes)	0.74 (0.55, 1.00)	0.053

The least square means and OR are adjusted for ISS, age, cardiopulmonary and prior surgery in a multivariate model for each of the outcomes. Least square means are presented with SEs. ORs are presented with 95% CIs.
ICU, intensive care unit; ISS, injury severity score.

Table 3 illustrates patient demographics for the incidental group according to different classifications. Patients with class 3 findings were found to have the longest hospital stays (9.8±17 days) followed by class 2 (9.0±11.3 days) and class 1 (7.2±6.9 days) without significance (p=0.1206). Age and age >65 years, when compared by classification were still significant.

Follow-up outcomes of the trauma admission were reviewed and only 99 (11%) patients had post-trauma follow-up visit in the trauma clinic (incidental group 36 (10%) and non-incidental group 63 (12%)). Review of patients who had surgery in the same hospital admission for incidental finding revealed that one patient with abdominal aortic aneurysm underwent surgical repair. One-year follow-up with social security index was performed to review vital status of patients discharged alive at the time of the study resulted with an overall mortality of 19% (168 patients, excluding the in-hospital deaths). In the subgroups, the 1-year mortality was higher in the incidental group at 22% (76 patients) compared with the non-incidental group at 17% (92 patients), after excluding the in-hospital deaths.

Seven biopsies were done to evaluate masses for malignancy. Six were negative for malignancy and one patient was positive.

Table 4 presents the multivariate model of adjusted analysis for the significant findings of age >65 years, history of cardiopulmonary disease, history of prior surgery and ISS. It was found that the length of stay remained significant after adjusting for significant confounders (8.7±0.48 vs 6.7±0.55, p=0.005). One-year mortality and ICU admission were not significant when adjusted for incidental findings.

DISCUSSION

This study was conducted to evaluate the frequency, length of stay and follow-up on incidental findings in our trauma patient population and their disposition. These incidental findings were defined as pathologies not related to trauma, which may or may not require further investigation or intervention.[8 9] These findings might be beneficial for earlier detection of diseases such as malignancy; however, it could also result in increased patient anxiety, length of stay and an impact on healthcare costs.[8 12 13 20]

Our study showed that the percentage of the incidental findings in retrospective chart review was 40% in our trauma patients. Not surprisingly, most of the findings were discovered in CT scans of the abdomen and pelvis; CT scans of the head revealed the least number of findings, despite being the most frequently done. Sixty-three per cent of findings were defined as class 2. These findings, when further investigated did not require immediate intervention or further diagnostic studies before discharge.

However, given the frequency and relevance of the incidental findings, these findings should not be underestimated and some sort of follow-up is required. Therefore, the incidental findings should be communicated to the patient or their family members and documented in the chart.[8 9] The association between the incidental findings and the gender in trauma population was reported to be different in various studies. Although Barboza *et al*[19] did not find any association, Barrett *et al*[14] and Pasluska *et al*[7] reported the incidental findings to be more frequent in female patients. Our study demonstrated a higher frequency of incidental findings in female populations (42%). Only one patient with an incidental finding on CT imaging required a surgery (abdominal aortic aneurysm repair) during the same admission. All other surgeries performed were trauma related.

What we also found is lack of documentation and lack of follow-up for these findings, which has a significant clinical and medico-legal ramification.[9 13] Poor documentation has been described previously, which we believe may be due to focusing more on the injuries from the trauma, which is expected, and not paying attention to these incidental findings.[7 9 12–14] Only 10% of our trauma patients had follow-up visits to our trauma clinic. To insure accurate documentation, a section was added in our history and physical, as well as our discharge instructions, which obligates the clinical staff to report whether or not incidental findings are found in our trauma imaging studies and the need for follow-up.[13 14] Furthermore, a hard copy of the CT scan reports and imaging 'CD' should be provided to the patients to educate them about these findings and to prevent any further unnecessary or repeating imaging studies that might cause unnecessary increase in health cost.

A lot of studies have reported a scoring system or classification for these incidental findings per their clinical significance.[3 9 10 12–14] We have designed a classification to better evaluate these findings, which will help with further management. This classification will act as a guideline that will allow appropriate follow-up and resource distribution. A good referral system by emergency department physicians and trauma surgeons should be developed for adequate follow-up.

Class 3 findings, the most clinically concerning category, represents 28% in our study. Class 3 findings were suspicious for malignancies, metastatic disease or vascular aneurysms, which might represent a life-threatening condition to the patient's health. Also, steps should be taken to increase the patient's knowledge regarding a normal anatomical variant or benign finding, like those in class 1, which may prevent future confusion or unnecessary investigations.

On the other hand, incidental findings increase the challenge and work load of physicians. During trauma management, there are many incidental findings that are not important during the initial trauma care, but still might be important for patient's further health. Therefore, the clinical relevance of these findings needs to be weighed against the patient's actual injuries and also against the patient's future health. Early identification of incidental findings increases patient survival and decreases morbidity.[12] However, overdiagnosis might lead to unnecessary diagnostic testing.[13] Shetty *et al* looked at thyroid nodules found incidentally on CT scan.[17] Of 230 patients who were found to have thyroid nodule, 118 underwent biopsy and 22% were found to be malignant. It has also been reported that 29% of incidentally discovered adrenal masses >3 cm in diameter were determined to be malignant.[9 18] Even asymptomatic biliary or renal stones found on CT scan are helpful to patient's physician or other healthcare providers in the future if these stones become symptomatic.[14] In our study, we found 18 patients in the incidental group that were identified with otherwise normal anomalies listed as incidental by the radiologist based on dimensional review of the CT scan.

Another challenge in the management of these findings is patients who are discharged from the ED after completion of trauma evaluation but before the completion of official CT scan reports. Patients may be sent home based on preliminary negative CT scan for trauma injuries that later are amended with a report of incidental findings.[14 21] Furthermore, a continued follow-up is the key in evaluating patient progress, trauma service equipped with a liaison service to review patient outcomes in quality control could advise and follow-up on these findings.

Finally, the hospital length of stay was noted to be longer for patients with incidental findings compared with those without (8.7 vs 6.4 days). This finding was further broken down into the classification system we created to look at the class distribution of the length of stay. Patients with class 3 findings had the longest length of stay, followed by class 2 and class 1 without significance. In class 2 and class 3, the mean length of stay was 9 days (9.0±11.3 and 9.8±17.0, respectively) and 7 days for class 1 (7.2±6.9 days). This could be explained by the need for more imaging studies and consultations to be done for patients with incidental findings that were identified. If patients in class 2 and class 3 were evaluated with our proposed classification, this length of stay of 9 days could have been stratified and reduced with an outpatient referral follow-up system in place. This also may have impact on increasing the healthcare cost, especially if the patient has a benign lesion that does not require any intervention.

Limitations

There are several limitations to our analysis. First, our study is retrospective and subject to multiple biases from differences in our patient populations to different risk factors than other regions. Thus, the results may not be applicable to all hospitals. A prospective study could be proposed with our system to further evaluate quality metrics. Second, there was little documentation about any further follow-up or intervention done postdischarge. It is possible that the patients were verbally given follow-up instructions; if this is the case, lapses in documentation are still of concern. Finally, this study is a short-term study. There was no long-term follow-up. Therefore, the data regarding how many biopsies were performed may not be beneficial.

CONCLUSION

Incidental findings are commonly found during CT imaging in trauma centers. The rate of incidental findings (40%) in our center is in line with the national range, which is between 30% and 53%. Appropriate documentation, communication and follow-up of these incidental findings is necessary. A classification system for these findings practiced nationwide will aid in categorizing the urgency of further follow-up, once a trauma emergency has been stratified. This will help decrease hospital length of stay and overall healthcare cost.

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Contributors PA: study design, development of methodology, data analysis, data collection, writing sections of the manuscript. AAP: study design, development of methodology, supervision. MAS: data analysis, data collection, writing sections of the manuscript. BA: study design, development of methodology, data analysis. WVW: data collection, data analysis. SD: statistical analysis. CF: study design, data analysis, supervision.

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