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Incidental findings on emergency CT scans: predictive factors and medico-economic impact

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Abstract (245 words/250)

Purpose: The main objective was to evaluate types and predictive factors of incidental findings (IFs) on multidetector computed tomographies (MDCTs) performed for an emergency department (ED). The secondary aim was to analyze additional investigations, their benefits, side effects, costs and the final diagnoses.

Method: One thousand consecutive patients over 18 years old who underwent an MDCT in the ED of our institution from January 2011 to November 2011 were retrospectively included, accounting for 300 head MDCTs and 700 other MDCTs. The following criteria were collected in patient electronic medical records: IFs (divided into low and high clinical significance), body areas covered, availability of a prior imaging, radiologist's experience and subspecialty, additional investigations, their outcomes and costs.

Results: Among the 1000 included patients, 232 had at least one IF and 122 had at least one IF of high clinical significance (IFCS). There were 340 IFs and 150 IFCSs. A significant association with the presence of at least one IF was noted for older patients, less-experienced radiologists, no subspecialty of the radiologist, the abdominopelvic area, and the absence of prior imaging. Eighteen IFs generated additional investigations in our institution, including five invasive samplings and three surgical operations, with two diagnoses of malignancy (a gastrointestinal stromal tumor and a Bosniak IV cystic renal lesion). One benign iatrogenic complication occurred. Total cost of these investigations was €41,247 (with an average of €2,292 per IF investigated).

Conclusion: IFs on emergency MDCTs were frequent, rarely severe, rarely iatrogenic and relatively expensive.

Keywords (6/6): incidental findings, emergency department, computed tomography, clinical significance, risk-benefit ratio, cost-effectiveness ratio

Abbreviations: CT (computed tomography), DRG (diagnosis-related group), ED (emergency department), GIST (gastrointestinal stromal tumor), IF (incidental findings), IFCS (incidental findings of high clinical significance), MDCT (multidetector computed tomography), MRI (magnetic resonance imaging), SD (standard deviation).

Introduction

General background

Multidetector computed tomographies (MDCTs) ordered by emergency departments (ED) are supposed to answer a well-targeted question [1]. However, MDCTs often lead to incidental findings (IFs), defined as "results that are outside the original purpose for which the test was conducted" [2,3]. In the literature, each emergency MDCT reveals an average of 0.6 to 2.2 IFs [4,5], and 19 to 40% of these present at least one IF of high clinical significance (IFCS) [5,6].

Specific background

IFs often lead to additional investigations, providing an opportunity to diagnose relevant diseases, such as cancers, in their preclinical phase [7]. However, these investigations are sometimes invasive and can cause side effects as in the study of Morgan AE et al. in 2015 reporting two deaths from surgical procedures related to extra-urinary IFs on 143 computed tomographies (CTs) performed for hematuria [8]. The risk-benefit ratio of IFs has received little academic attention in the literature [9]. The main issue is the lead time bias, i.e. a distortion of our perception of the survival time created by a disease detection in its preclinical phase [10]. In addition, it is recognized that IFs may cause anxiety in patients [11,12]. Moreover, additional investigations linked to IFs are costly for society [2,13] while the vast majority of IFs are not malignant, only 3% in Kelly's study [7]. In the literature, many studies described the rate of IFs in specific clinical situations [7,8,14]. Others have suggested guidelines to manage the follow-up of IFs [15,16]. To our knowledge, however, no study has exhaustively addressed the problem of the IF in the emergency department imaging, particularly with respect to the predictive factors of IFs in the reports of radiologists and emergency physicians. Likewise, the overall prognosis of patients and the cost to society has not been studied for IFs performed on emergency CT scans.

Issue

The radiologist has a duty to analyze the whole data contained in the pictures, even those not related to the symptomatology [9,17]. Obviously, if a radiologist notes an abnormality, he/she cannot ignore it and must communicate it because he/she cannot judge alone if this finding is relevant or not regarding the patient's history. However, is it appropriate to actively search for any small abnormality unrelated to the symptomatology that could be present on the field of acquisition of an MDCT ordered by an emergency physician? Taken to the extreme, could it be deleterious to the patient or society?

Purpose

The main aim of this study was to evaluate types, prevalence and predictive factors of IFs on MDCTs performed for an ED.

Secondary aims were:

- to study the transmission of the IFs from the radiologist to the ED and predictive factors of their report in the emergency discharge paperwork;
- to inventory additional tests and procedures performed for each IF, their benefits, side effects, costs and the final diagnoses.

Method

Patients

This study was approved by our local institutional ethics review board.

One thousand individual consecutive patients over 18 years old who underwent a CT scan in the ED of our tertiary referral university-affiliated hospital from January 2011 to November 2011 were retrospectively included.

Although brain CT scans represented two thirds of all CT scans in the ED of our institution, we limited inclusion to 300 consecutive patients who underwent a single brain CT scan, to avoid an overrepresentation of brain CT scans. The other 700 patients underwent a CT scan covering other parts of body that could include the brain (named "non-brain CT scans").

CT scans

All CT scans were performed in our institution on a 64-slice MDCT (Optima CT660, GE Healthcare, date of commissioning: September 2010). MDCT parameters were: 512x512 pixel matrix, 64x0.625 mm collimation. Slice thickness and reconstruction interval were 1.25 mm and 0.90 mm respectively for abdominopelvic MDCTs, 1.25 mm and 0.63 mm for head and neck MDCTs, and 0.63 mm and 0.63 mm for lung, spine and limb MDCTs. Intravenous contrast agents were Omnipaque 350 mg/ml (GE Healthcare), Visipaque 320 mg/ml (GE Healthcare) or Xenetix 350 mg/ml (Guerbet).

Recorded data

MDCTs were initially analyzed by the radiologist on duty who wrote a report. Retrospectively, all patient electronic medical records were read by a single radiology resident who collected the following criteria:

- age and sex of patients;
- IFs in the MDCT report;
- body areas covered by the CT scan (head, neck, chest, abdominopelvic cavity, spine, limbs);
- MDCT time of day;
- availability of a prior CT scan or Magnetic Resonance Imaging (MRI) covering the same area during the previous 10 years on our Radiological Information System or on our Picture Archiving and Communication System;
- radiologist's experience, considering as junior if they were resident or graduated less than two years ago, and senior for other cases;

- radiologist's subspecialty (head and neck, chest, digestive, urology, musculoskeletal, vascular, pediatric, general);
- clinical indication of the MDCT;
- presence of an abnormality in the MDCT report supposedly related to the patient's symptomatology;
- hospitalization or direct home discharge after emergency admission;
- report of the IF and advice to carry out additional investigations in the emergency discharge paperwork;
- in the subgroup of patients followed in our institution: additional examinations and treatments related to the IF until 2019, their costs, the final recorded diagnoses and overall 5-year mortality.

Incidental findings

IFs were defined as "findings unrelated to the chief complaint and not pertinent to the immediate patient care in the ED" [18]. All the IFs were collected and grouped by similarity. They were divided into low and high clinical significance: IFs of high clinical significance were defined as needing additional tests or care according to guidelines from scientific societies [13].

In *supplementary material I*, items not recorded as IFs (because of very high frequency and very low clinical significance) are listed [6].

Cost of additional care

For cost evaluation, the perspective chosen is the French national health insurance system. Indeed, additional examinations and treatments will principally impact the French national health insurance system. The costs are expressed in euros (€). We chose to use 2019 rates to better represent the costs of medical investigations. Basically, in France, a price is defined for each medical act performed for outpatients (for example, €180 for adrenal scintigraphy [19]). The national healthcare system covers a variable part of this cost: 70% of the price for medical fees and professional component of radiology procedures, 100% of the price for technical component of radiology procedures, and 60% of the price for biological tests (blood and urine samples analyses). The remaining part is reimbursed by private insurance.

For hospitalized patients, the national healthcare system provides a global price for the entire patient hospital stay depending on the reason for hospitalization and its duration: price of diagnosis-related group (DRG) (for example, €4,935 for stay for adrenalectomy lasting less than 7 days [20]). The price of DRG includes imaging, biology, surgery and drugs.

Statistical analysis

Univariate analyses were performed using Fisher's exact test and chi-squared test for categorical variables, and Mann–Whitney U test for quantitative variables. Multivariate analyses were performed using multinomial logistic regression. A P-value lower than 0.05 was considered significant. Sample size was derived with an Arcsin approximation (878 patients to compare two proportions of 0.25 and 0.35 with two-tailed tests and alpha and beta risks of 0.05 and 0.1 respectively). Statistical analyses were achieved with the online biostatistics software of our National Institute for Health and Medical Research (INSERM), and with Statistical Package for the Social Sciences (SPSS) version 20.0.0 (IBM corporation).

Results

Population (Table A.1)

Among the 300 patients who underwent a brain MDCT, 52% (157/300) were women, the mean age was 54.5 years old (SD: 24.4), 11% (33/300) had at least one IF, and 1% (4/300) had at least one IFCS. Among the 700 patients who underwent a non-brain CT scan, 46% (320/700) were women, the mean age was 50.9 years old (SD: 21.9), 28% (199/700) had at least one IF, and 17% (118/700) had at least one IFCS.

Thirteen percent of patients (127/1000) were hospitalized following the ED admission, 3% (34/1000) died in the ED or in the following hospitalization, 45% (447/1000) had their CT scan between 8:00 am and 6:00 pm. The main clinical indications were head trauma (10%, 100/1000), stroke (11%, 107/1000), full-body CT for trauma (15%, 150/1000), suspected pulmonary embolism (17%, 172/1000), renal colic (4%, 43/1000), bowel obstruction (3%, 30/1000). A prior sectional imaging during the past 10 years was available for 18% of patients (182/1000). The MDCT was read by a junior radiologist for 22% of patients (218/1000), and by a general radiologist for 9% of patients (90/1000). A diagnosis related to the chief complaint was made for 33% of patients (326/1000).

Incidental findings

In the 300 brain CT scans, there were 47 IFs, of which 6 were IFCSs. In the 700 non-brain CT scans, we reported 293 IFs, of which 144 were IFCSs. Twenty-six percent of IFs (87/340) and 37% of IFCSs (55/150) were reported in the emergency discharge paperwork, with a recommendation to carry out additional investigations for 8% of IFs (27/340) and 15% of IFCSs (22/150). Eighteen IFs generated additional investigations in our institution.

Among the 135 patients who underwent a full-body CT scan for trauma, 27% (36/135) had at least one IF, and 13% (17/135) at least one IFCS (mean age: 36.4 years old, SD: 17.2). Regarding patients with suspected pulmonary embolism, 12% (21/171) had at least one IF and 9% (15/171) at least one IFCS (mean age: 59.5 years old, SD: 20.7). In abdominopelvic emergency MDCTs, 35% (148/425) of patients had at least one IF and 20% (83/425) at least one IFCS (mean age: 46.7 years old, SD: 21.3).

The most common IFCS was the hepatic nodule, which accounted for 6% of abdominopelvic IFs (14/221) in six women, with a mean age of 49.6 years old (SD: 17.4), six reports in the emergency discharge paperwork, and two follow-ups. The main others IFCS were lung nodules, steatosis, adrenal mass, biliary tract dilatation, ovarian cysts, urinary tract dilatation, and thyroid nodules.

Factors associated with the presence of an IF (Table A.1)

In multivariate analysis, a significant statistical association with the presence of at least one IF was noted for: older patients (55.9 years old, SD:21.2 versus 50.7 years old, SD: 24.6; OR = 1.01; 95% CI = [1.007; 1.02]; p<0.001), less experienced radiologists (33% for junior versus 21% for senior; OR = 2.2; 95% CI = [1.5; 3.0]; p<0.001), no subspecialty of the radiologist (37% for general radiologist versus 22% for specialized radiologist; OR = 2.6; 95% CI = [1.6; 4.2]; p<0.001), abdominopelvic area (35% versus 9% for other regions; OR = 7.1; 95% CI = [5.1; 9.9]; p<0.001), and the absence of prior sectional imaging (25% versus 16%; OR = 2.1 ; 95% CI = [1.4; 3.3]; p=0.001).

We did not observe any significant association between the presence of an IF and five-year mortality, the time of day or the presence of an abnormality on the MDCT to explain the chief symptom.

Factors associated with the presence of an IFCS (Table A.2)

In multivariate analysis, a significant statistical association with the presence of at least one IFCS was noted for: older patients (56.2 years old, SD: 19.7 versus 51.3 years old, SD: 23.0; OR = 1.01; 95% CI = [1.002; 1.02]; p=0.01), less experienced radiologists (17% versus 11%; OR = 1.8; 95% CI = [1.2; 2.8]; p=0.006), no subspecialty of the radiologist (18% versus 12%; OR = 1.9; 95% CI = [1.1; 3.5]; p=0.03), abdominopelvic area (20% versus 4%; OR = 9.4; 95% CI = [6.0; 14.9]; p<0.001).

There was no significant association between the presence of an IFCS and five-year mortality, the time of day, the presence of prior sectional imaging or the presence of an abnormality on the MDCT to explain the chief symptom.

Association between IF of a body area and subspecialization of the radiologist in this area (Table B)

In multivariate analysis, digestive and uroradiologists described significantly more digestive and urologic IFs than the other radiologists (75% versus 60%; OR = 1.9; 95% CI = [1.1; 3.2]; p=0.01). The same phenomenon was noted for IFCSs (80% versus 60%; OR = 2.5; 95% CI = [1.1; 5.7]; p=0.02). This association was not observed for other subspecialties, except for musculoskeletal radiologists concerning all IFs regardless of their clinical significance (10% versus 4%; OR = 3.3; 95% CI = [1.05; 8.6]; p=0.04).

Factors associated with the IF report in the emergency discharge paperwork (Table C)

In multivariate analysis, a significant statistical association with the IF report in the emergency discharge paperwork was noted for high clinical significance of the IF (63% versus 36%; OR = 3.6; 95% CI = [2.1;

6.1]; p<0.001), and the absence of MDCT diagnosis to explain symptomatology (75% versus 25%; OR = 1.9; 95% CI = [1.03; 3.4]; p=0.04).

Additional investigations, costs and final diagnoses generated by IFs (Table D, Figure A and Supplementary material B)

Among the 122 patients presenting at least one IFCS, 11% (14/122) came back to our institution for additional investigations, including six invasive procedures. Five underwent transcutaneous biopsies or transdigestive biopsies. Three underwent surgery, leading to the diagnoses of gastrointestinal stromal tumor (GIST), adrenocortical adenoma and retroperitoneal Castleman disease.

One iatrogenic complication related to IFs occurred (an acute urinary retention following the radiofrequency ablation of the Bosniak category IV cystic renal lesion; the patient's hospital stay was extended by one day).

The total cost of additional investigations and procedures was €41,247 (of which €24,963 was for in-hospital care) with an average of €2,578 per patient followed (including the two patients followed up with non-clinically significant IFs).

Two diagnoses of malignancy were made, namely a low risk GIST of Fletcher's classification in a healthy 49-year-old woman (histologically proven) and a Bosniak IV cystic renal lesion (histologic sample was inconclusive) in a 73-year-old man who died from another cancer.

Discussion

In this study, IFs on emergency MDCTs were frequent (11% of brain MDCTs, and 28% of non-brain CT scans), but rarely severe (only two malignant diagnoses), rarely iatrogenic (only one documented benign complication) and relatively expensive (average cost of €2,578 per patient followed).

In the literature, most of the other studies were focused on only one body area or one type of indication. However, comparing results by body area or indication to studies with a similar methodology, our results are close to the literature. In Anjum et al.'s study [14], 13% (223/1708) of patients with suspected pulmonary embolism had at least one IF versus 12% (21/171) in our study. In abdominopelvic emergency MDCTs, 35% (148/425) of our patients had at least one IF, versus 42% (1155/2745) in Kelly et al.'s study [7].

With respect to the predictive factors of IFs, the junior radiologists' propensity to describe IFs was higher than that of senior radiologists. It is interesting to see that the difference was smaller for IFCSs (OR = 2.2 versus OR = 1.8). Our assumptions are that younger radiologists are less confident about what is of low or high clinical significance and that they need to prove their reliability to their correspondents.

We also showed that abdominopelvic radiologists described more IFs in their own specialty than other radiologists (OR = 1.9), with a higher effect when limiting to IFCSs (OR = 2.5). There seems to be an added value in being a specialist in differentiating important incidentalomas from others [21].

We did not show any significant difference regarding the time of day and the presence of an abnormality supposedly related to the patient's symptomatology. This reflects the systematic way that radiologists analyze scanners and leads to more IFs.

Absence of prior CT scanner was a significant predictive factor for the presence of an IF (OR = 2.1). However, we did not show such an association concerning IFCSs. This draws attention to the fact that IFCSs were evolutive abnormalities and were well classified.

The overall report rate of IFs in emergency discharge paperwork was low in our study (26% (87/333) for all IFs, 37% (55/150) for IFCS) but higher than or similar to what is observed in the literature (10% (34/448) for Thompson et al. [18] and 27% (69/253) for Munk et al. [22]). The first explanation is probably that radiologists focused their provisional report on the initial indication and described IFs in the final report. The second explanation is that the overwork of emergency physicians does not let them deal with IFs as much as they would like. However, there was no significant difference in the report rate regarding the time of

day or the age of the patients. This reflects the constant work of emergency physicians. The low reporting rate of IFs in the emergency discharge paperwork indicates an area for improvement. In this regard, Baccel et al. evaluated in 2018 a specific workflow for IFs on medical imaging in an emergency department in which a nurse had to ensure that the IFs were reported in the emergency discharge paperwork, with good results on the follow-up rate of IFs [23].

Regarding the final diagnoses, Kelly et al. [7] reported a diagnosis of cancer in 2% (24/1155) of emergency abdominopelvic MDCTs (versus 0.5% (2/425) in our study). This difference could appear surprising because methodologies were similar (retrospective study, including all indications, in a tertiary referral university-affiliated hospital). However, we hypothesize that the younger median age of the patients in our study (42 years old for abdominopelvic MDCTs, versus 57 years old) and the lower incidence of cancers in our administrative department (360/100,000 persons per year [24], versus 428/100,000 in the county of Kelly et al.'s study [25]) could be the main explanations of the lower rate of cancer in our study.

Concerning the cost of additional care related to IFs, to our knowledge, no study dealing with the overall emergency CT scans has assessed real costs of follow-ups on IFs. Furthermore, costs and side effects of IFs must be balanced with the costs and morbidity of a late disclosure of a severe diagnosis at a symptomatic stage. For example, the GIST incidentally discovered at a low risk stage in the 49-year-old woman would have been more expensive and a source of morbidity if revealed a few years later. Nevertheless, if the follow-up rate of IFs was higher, the cost might exceed that of chemotherapy. The benefit / risk ratio is even more uncertain. Even if it seems favorable in our study (which does not have the necessary statistical power), this is less evident in Morgan's study for example (2 deaths following IFs in 143 patients) [8]. This is difficult to study because it would raise methodological and ethical issues [10]. Beyond reporting non-pertinent IFs, the real problem is unnecessary investigations (because of side effects, costs and anxiety of the patients). A good way to deal with this issue would be to continue to apply the principle whereby the radiologist is responsible for looking for and describing all abnormalities present on each MDCT slice, even those unrelated to the chief complaint, but minimizing the prevalence of IFs by ordering only necessary CT scans [3] and following point-of-care reference materials to manage the IFs [26], such as suggested by the white papers of the American College of Radiology Incidental Findings Committee [15]. This would avoid the vicious circles in which the exploration of an IF leads to the finding of a new incidentaloma.

Our study was based on 2011 data, which may not seem to be consistent with the current situation. However, we chose to have a lengthy follow-up to assess the potential impact of the IFs. Furthermore, since this scanner was commissioned in 2010, the data was acquired on an updated machine. The main limitation of our study is that a follow-up investigation was available only for patients who chose our institution for additional investigations (11%, 14/122). As a result, we may miss some of the explorations carried out in relation to the IFs in our results. But we can imagine that if severe diagnoses related to these IFs were made outside our hospital, they would have been referred and treated in our institution and therefore we would have had a record of them. Even beyond our study, the rate of follow-up is always low in the literature: 19.4% reported by van Vugt in 2012 [6] and 26.9% by Munk in 2010 [22]. The main reason is probably that a significant part of patients come to tertiary referral university-affiliated hospitals for emergency situations but choose their usual primary care centers for non-emergency additional investigations. However, it can also highlight the lack of transmission of incidental findings and 'medical nomadism.'

In conclusion, IFs on emergency MDCTs were frequent, but rarely severe, rarely iatrogenic and relatively expensive. Costs and side effects of additional investigations could be minimized by following point-of-care reference materials without reducing the rate of detecting relevant incidental findings.

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Figures

Figure A: Flow-chart.
ED: emergency department. EDP: emergency discharge paperwork. GIST: gastrointestinal stromal tumor. IF: incidental finding. MDCT: multidetector computed tomography.

Tables

Table A: Factors associated with the presence of an incidental finding

A.1: univariate analysis

Factors	All (n=1000)	IF (n=232)	no IF (n=768)	p	IFCS (n=122)	no IFCS (n=878)	p
Mean age *years old (SD)*	51.9 (22.7)	55.9 (21.2)	50.7 (24.6)	**0.001**	56.2 (19.7)	51.3 (23.0)	**0.02**
Sex							
Female	477	103 (22%)	373 (78%)	0.3	57 (12%)	420 (88%)	0.8
Male	523	129 (25%)	395 (75%)		65 (12%)	458 (88%)	
Body area							
Abdomen-pelvis	425	148 (35%)	277 (65%)	**<0.001**	83 (20%)	342 (80%)	**<0.001**
Chest	390	43 (11%)	347 (89%)		31 (8%)	359 (92%)	
Spine-Limbs	91	8 (9%)	83 (91%)		2 (2%)	89 (98%)	
Head	443	44 (10%)	399 (90%)		6 (1%)	437 (99%)	
Neck	163	3 (2%)	160 (98%)		1 (1%)	162 (99%)	
MDCT time							
8 am - 6 pm	553	134 (24%)	419 (76%)	0.4	67 (12%)	486 (88%)	0.9
6 pm - 8 am	447	98 (22%)	349 (78%)		55 (12%)	392 (88%)	
Prior sectional imaging							
Yes	182	30 (16%)	152 (84%)	**<0.001**	18 (10%)	164 (80%)	**0.008**
No	818	202 (25%)	616 (75%)		104 (13%)	714 (77%)	
Radiologist							
Senior	782	161 (21%)	621 (79%)	**<0.001**	85 (11%)	697 (89%)	**0.01**
Junior	218	71 (33%)	147 (67%)		37 (17%)	181 (83%)	
General	90	33 (37%)	57 (63%)	**0.002**	16 (18%)	84 (82%)	0.2
Subspecialized	910	199 (22%)	711 (48%)		106 (12%)	804 (88%)	
MDCT							
positive for indication	326	78 (24%)	248 (76%)	0.7	47	279	0.1
negative for indication	674	154 (23%)	520 (77%)		75	599	
Hospitalization							
Yes	127	31 (24%)	96 (76%)	0.7	19 (15%)	108 (85%)	0.3
No	873	201 (23%)	672 (77%)		103 (85%)	770 (15%)	
5-year death (487 md)							
Yes	93	21 (23%)	72 (77%)	1	11 (12%)	82 (88%)	0.9
No	420	98 (23%)	322 (77%)		56 (13%)	364 (87%)	

A.2: multivariate analysis

Factors	At least one IF			At least one IFCS		
Age	OR = 1.01	95% CI = [1.007; 1.02]	**p<0.001**	OR = 1.01	95% CI = [1.002; 1.02]	**p=0.01**
Area						
AP	OR = 7.1	95% CI = [5.1; 9.9]	**p<0.001**	OR = 9.4	95% CI = [6.0; 14.9]	**p<0.001**
Chest	OR = 0.4	95% CI = [0.3; 0.6]	**p<0.001**	OR = 0.1	95% CI = [0.05;0.3]	**p<0.001**
Spine-limbs	OR = 0.4	95% CI = [0.2; 0.9]	**p=0.03**	OR = 0.1	95% CI = [0.02; 0.8]	**p=0.03**
Head	OR = 0.5	95% CI = [0.3; 0.7]	**p<0.001**	OR = 0.1	95% CI = [0.05; 0.3]	**p<0.001**
Neck	OR = 0.1	95% CI = [0.02; 0.3]	**p<0.001**	OR = 0.1	95% CI = [0.01; 0.6]	**p<0.001**
No prior sectional imaging	OR = 2.1	95% CI = [1.4; 3.3]	**p=0.001**	OR = 1.6	95% CI = [0.9; 2.7]	p=0.1
Radiologist						
Junior	OR = 2.2	95% CI = [1.5; 3.0]	**p<0.001**	OR = 1.8	95% CI = [1.2; 2.8]	**p=0.006**
General	OR = 2.6	95% CI = [1.6; 4.2]	**p<0.001**	OR = 1.9	95% CI = [1.1; 3.5]	**p=0.03**
MDCT negative	OR = 1.05	95% CI = [0.8; 1.5]	p=0.8	OR = 0.8	95% CI = [0.5; 1.2]	p=0.3

AP: abdomen-pelvis. IF: incidental finding. IFCS: incidental finding of high clinical significance. md: missing data. MDCT: multidetector computed tomography. OR: Odds ratio. SD: standard deviation. CI: confidence interval.

Table B: Association between incidental findings of a body area and subspecialization of the radiologist in this area (multivariate analysis)

Radiologist's specialty	Presence of an IF in their specialty	Presence of an IFCS in their specialty
Head-neck	OR = 0.3 95% CI = [0.1; 1.0] p=0.051	not applicable (division by 0)
Chest	OR = 2.8 95% CI = [0.7; 11.6] p=0.1	OR = 4.7 95% CI = [0.6; 37.0] p=0.1
Digestive-Urology	OR = 1.9 95% CI = [1.1; 3.2] **p=0.01**	OR = 2.5 95% CI = [1.1; 5.7] **p=0.02**
Musculoskeletal	OR = 3.3 95% CI = [1.05; 8.6] **p=0.04**	OR = 1.2 95% CI = [0.2; 6.9] p=0.8

(potential confounding factors included in the analysis: age of patients, radiologists' experience)
IF: incidental finding. IFCS: incidental finding of high clinical significance. OR: Odds ratio. 95% CI: 95% confidence interval.

Table C: Factors associated with the incidental finding report in the emergency discharge paperwork

Factors	**Report (n=87)**	**No report (n=246)**	**p (uni-variate)**	**OR (multivariate)**		
Mean age *years old (SD)*	60.2 (20.8)	56.1 (20.5)	0.1	OR = 1.01	95% CI = [1.0; 1.03]	p=0.051
Time						
8 am - 6 pm	52 (27%)	142 (73%)	0.8	OR = 1.3	95% CI = [0.8; 2.2]	p=0.3
6 pm - 8 am	35 (25%)	104 (75%)		*reference*		
Significance of IF						
high	55 (38%)	89 (62%)	**<0.001**	OR =3.6	95% CI = [2.1; 6.1]	**p<0.001**
low	32 (17%)	157 (83%)		*reference*		
MDCT						
negative for indication	65 (29%)	157 (71%)	0.07	OR = 1.9	95% CI = [1.03; 3.4]	**p=0.04**
positive for indication	22 (20%)	89 (80%)		*reference*		
Hospitalization						
No	81 (28%)	210 (72%)	0.06	OR = 2.4	95% CI = [0.9; 6.1]	p=0.07
Yes	6 (14%)	36 (86%)		*reference*		

7 pieces of emergency discharge paperwork missing.
MDCT: multidetector computed tomography. IF: incidental finding. OR: Odds ratio. SD: standard deviation. 95% CI: 95% confidence interval.

Table D: Additional investigations, costs and final diagnoses (with invasive procedures)

Patient	Incidental finding	Invasive procedures	Total cost of investigations	Final diagnosis
49 y/o woman	Gastric mass of 3 cm	Echoendoscopic gastric biopsy Partial gastric resection	€10,191	Gastrointestinal stromal tumor (considered cured 7 years later)
77 y/o man	Probable pancreatic cystadenoma of 2 cm 2-centimeter kidney nodules	Echoendoscopic pancreatic cytopuncture	€1,735	"No malignant cell" Both IFs stable for 8 years
40 y/o woman	Liver nodule of 2 cm	CT-guided liver biopsy	€3,442	"Subnormal liver tissue" Stable for 4 years
52 y/o woman	Adrenal mass of 2 cm	Adrenalectomy	€7,864	Adrenocortical adenoma
73 y/o man	Bosniak IV kidney cyst of 13 mm	CT-guided kidney biopsy and radiofrequency ablation at the same time	€2,895	Inconclusive histology (died 4 years later from a periampullary carcinoma)
33 y/o man	Retroperitoneal mass of 9 cm with pulmonary micronodules	CT-guided retroperitoneal biopsy Surgical resection	€5,997	Castleman disease (pulmonary micronodules stable for 3 years)
59 y/o man	Incidental prostatic uptake on a PET-CT performed for incidental pulmonary nodules	Ultrasound-guided prostatic biopsies	€1,546	Chronic prostatitis Pulmonary nodules stables for 2 years

CT: computed tomography. IF: incidental finding. PET: positive emission tomography. y/o: year-old.

Figures

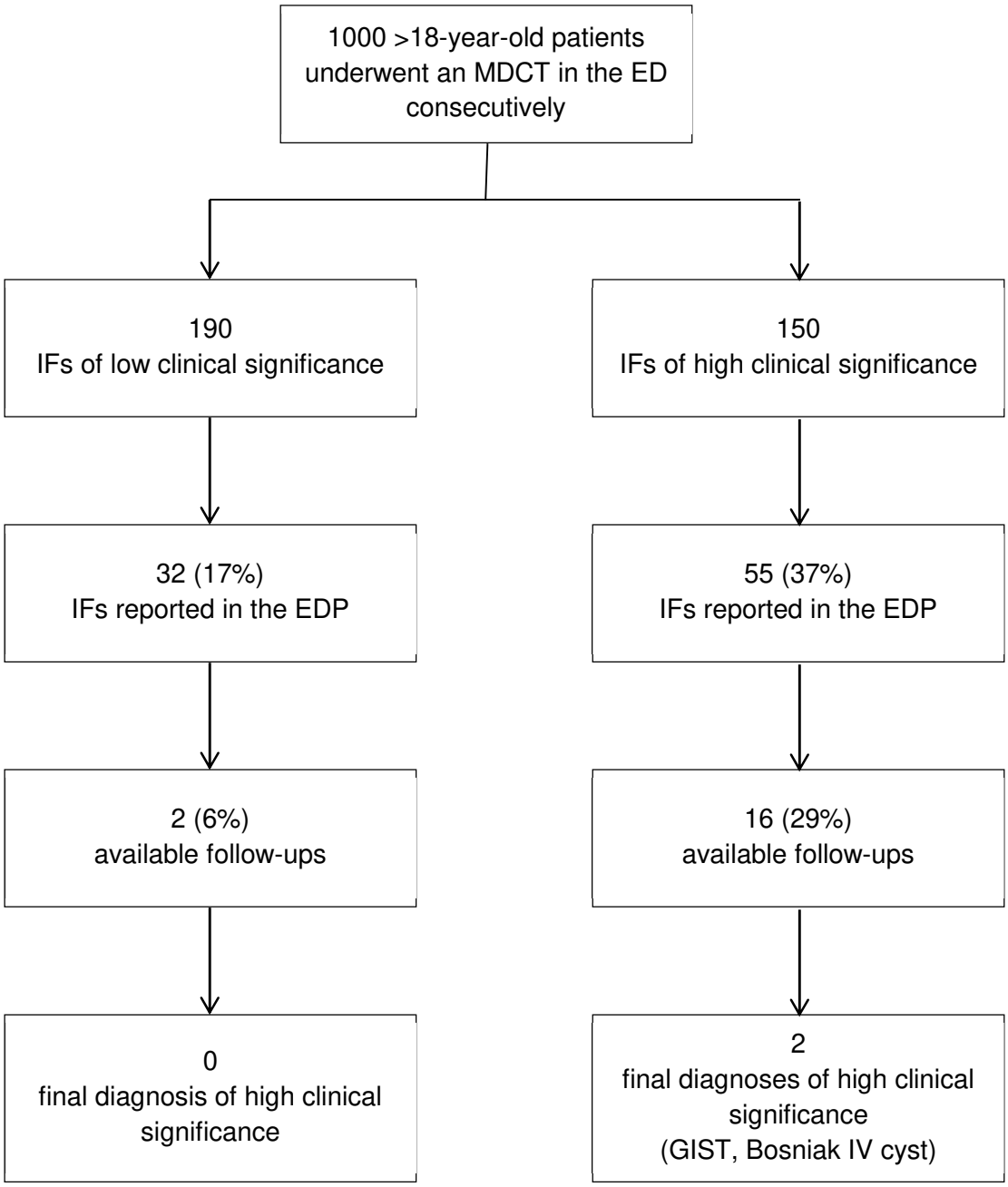


Figure 1: Flow-chart.

ED: emergency department. EDP: emergency discharge paperwork. GIST: gastrointestinal stromal tumor. IF: incidental finding. MDCT: multidetector computed tomography.