



# ACTUAL TOPICS AND NEW FRONTIERS IN EMERGENCY RADIOLOGY

BOOK  
OF  
PRESENTATIONS  
AND ORAL  
COMMUNICATIONS



**ACTUAL TOPICS AND NEW FRONTIERS IN EMERGENCY  
RADIOLOGY I**

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Editor SERAU

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Layout TACTILEVENTS

# ACTUAL TOPICS AND NEW FRONTIERS IN EMERGENCY RADIOLOGY

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Title	Thoracic emergencies in oncologic patients
Author	Ferco Berger Sunnybrook Health Sciences Centre University of Toronto Canada

**TEACHING OBJECTIVES:**

- to provide some background on the oncologic patient and their treatment
- to discuss the emergency conditions that can arise in the thorax of oncologic patients

**DISCUSSION:**

The number of people that are dealing with cancer has grown significantly over the last century, not only in absolute numbers due to growing population, but also in relative terms. Our ways to diagnose patients with cancer have improved, including techniques to collect tissue for definitive diagnosis. Treatment for the large variety of cancers has advanced, and survival has increased.

All these factors have contributed to more awareness of specific emergencies in the oncologic patient, either related to the disease process itself, or in response to diagnostic procedures and different treatment strategies. My presentation will provide background on these items and show examples of cases that are related to the different factors as described.

Title	Interactive case-based presentation (non-traumatic thorax)
Authors	Fernandez del Castillo, Monica (Tenerife, Spain)

## LEARNING OBJECTIVES

The aim of this interactive presentation is to highlight the importance of simple chest X-Ray, both in and outside the emergency department, demonstrating its great diagnostic validity.

## DISCUSSION

Non-traumatic urgent thoracic pathology includes a large number of entities of vital relevance to the patient, requiring the radiologist to be familiar with them in order to carry out the specific complementary tests that may allow them to approach the correct diagnosis. Through different clinical cases we will get into common pathologies in our working day, showing at the end of the cases the most relevant tips to get to diagnose them.



Title	Dyspnoea and fever in the ER: a case based approach
Authors	Mikel Grau García (Basurto, Spain)

**OBJECTIVE:**

interactive session based on six cases from our daily practice in the emergency radiology section.

**ABSTRACT:**

All the cases that we will review share the same clinical and radiological features, these being pulmonary opacities or consolidations, dyspnoea and fever.

Airspace consolidation can be caused by infection, hemorrhage or edema, entities that are radiologically not distinguishable. Hence a close collaboration with the clinicians is of utmost importance for a timely and correct diagnosis.

Oncologic patients on chemotherapy, transplanted patients and those with severe rheumatic diseases can present with alveolar hemorrhage secondary to vasculitides, lung toxicity or pulmonary infections related to immunosuppression.

Title	Acute chest pain
Authors	M. Scaglione Castel Volturno IT - Sunderland/UK

## **ACUTE CHEST PAIN**

Chest pain is a common presenting problem in every day practice. In the United States, an estimated 6-8 million people per year present to the emergency department with chest pain. An estimated 50-70% of patients presenting with chest pain in the emergency department will be placed in an observation unit or admitted to the hospital. Many are admitted unnecessarily for observation; 2-5% are discharged inappropriately. Most do not have cardiac etiology (70/90%). Approximately 8 billion dollars are used annually to evaluate complaints of chest pain. In the emergency setting, radiology is of great asset for timely identifying the castellation of possible diagnoses, risk stratification and medical decision making by using chest x-ray, CT and MR. In this lecture, the active role of emergency radiologists in the A&E is shown by illustrating lots of cases from the daily practice.

### **LEARNING OBJECTIVES**

1. To understand the role of plain film in the assessment of acute chest pain
2. To assess the role of MDCT, the clues for diagnosis and importance of this technique in the differential diagnosis
3. To show how and when MR is needed

Title	Code Stroke: what is new?
Authors	Calli, Cem (Izmir, Turkey)

## ABSTRACT

### CODE STROKE: WHAT IS NEW

Stroke is one of the most common reasons leading to mortality and morbidity in the world. Emergency rooms everyday receive many patients presenting with stroke. The treatment has a limited time window and includes either tissue plasminogen activators or endovascular interventions (mechanical thrombectomy and/or intraarterial thrombolysis). The time window of those therapies were limited in the first 3-6 hours until recently. The recent studies showed that this time window can be extended to 24 hours if clinical and imaging findings are appropriate. After 8 hours of onset of symptoms radiological assesment of the patients with CT / MR Perfusion and CT angiography has a crucial role to show if there is still salvagable tissue (ischemic but not infarcted). If there is still a salvagable brain tissue, mechanical thrombectomy is indicated till the 24 hours of onset of stroke symptoms.

<b>Title</b>	<b>SPINE AND SPINAL CORD TRAUMA: IMAGING OVERVIEW</b>
<b>Authors</b>	Camilo Pineda Ibarra (Barcelona, Spain).

**OBJECTIVES:**

- Determine the appropriate imaging strategies in spine trauma.
- Recognize the main stable and unstable vertebral lesions.
- Identify spinal injuries and their prognosis

**DISCUSSION:**

Approximately 3% of patients included in large trauma registries have spinal column injury and 1% sustains a spinal cord injury. The incidence is likely to be significantly higher in patients with head trauma and those who are unconscious at presentation. Additional noncontiguous spine fractures are common in patients diagnosed with a spine fracture following high-energy blunt trauma.

Determining the imaging approach in patients with spine trauma is essential. Multidetector spiral non-contrast CT is the primary screening study. Coronal and sagittal reconstructions help improve detection of fractures and malalignment. MR allows evaluation of the spinal cord and other soft tissues, and can offer prognostic information, but it has a suboptimal sensitivity for fractures. Protocols should include sagittal T1w, T2w, STIR and T2\* sequences in axial and sagittal plane. MRI role in the scenario of acute trauma is controversial and could be used for determining the cause of neurological symptoms after a negative CT. Plain film use is limited because of its low sensitivity (65– 85%), low accuracy for the craniovertebral junction, and poor visualization of C6 through T1 levels; also, linear or nondisplaced fractures can be difficult to detect, and fractures of the pedicle and uncinat process may not be seen.

After the scanning, the next step is to detect whether there are stable or unstable injuries. Stability is defined as the capacity of the spine to limit the segmental motion and to prevent damage or irritation of spinal cord or nerve roots. Trauma can disrupt one or more elements responsible for maintaining stability. Denis's model uses a 3-column system to evaluate spinal stability. The anterior column includes the anterior half of vertebral bodies, disks, and anterior longitudinal ligament; the middle column is comprised of the posterior half of the vertebral bodies, disks, and posterior longitudinal ligament; and the posterior column is made up of neural arches and the posterior ligamentous complex (supraspinous ligament, interspinous ligament, ligamentum flavum, and joint capsules).

Fractures considered typically stable are simple compression fracture, which make up for 50% of all traumatic thoracolumbar fractures, most commonly occurring at levels T12– L2; occipital condyle fracture type I is comminuted and nondisplaced and type II extending into the condyle from a linear fracture in the remainder of the skull base; C1 isolated fracture of the posterior arch type I

and anterior arc type II, C1 isolated lateral mass fracture type IV and C1 transversely oriented anterior arch fractures (avulsion of longus colli or atlantoaxial ligament) type V; odontoid fracture type I is an avulsion fracture of the odontoid tip and type III odontoid fracture extends from the dens through the body and/or lateral masses of C2 vertebra; unilateral facet dislocation and isolated lamina fracture, transverse process fracture and spinous process fracture are also stable. Stable vertebral fractures with no neurologic deficit or concomitant injury typically have a good outcome.

Unstable fractures are type III occipital condyle fracture consisting of avulsion fracture resulting from tension on the alar ligament; Jefferson burst fractures of the C1, with retropulsion of the posterior vertebral body fragments and interpedicular widening; odontoid fractures type 2 occurring at the base of the dens between the level of the transverse ligament and the C2 vertebral body; Hangman fracture (traumatic spondylolisthesis of the axis) is a bilateral fracture of the pars interarticularis of the axis, with or without concomitant body fragment displacement; anterior dislocation of the vertebral body on account of bilateral anterior facet dislocation; Chance fracture demonstrating anterior wedge fracture of the vertebral body with horizontal fracture through the posterior elements or distraction of facet joints and spinous processes; flexion teardrop fracture when flexion and translation forces cause the anterior vertebral column to fail and disrupt the anterior and posterior disco-ligamentous complexes, and distract posterior elements and rupture of posterior ligaments; and extension teardrop fracture when there is a triangular avulsion of the anterior inferior corner of the affected vertebral body, with anterior disc space widening and anterior longitudinal ligament displaced anteriorly with the bone fragment.

Acute injuries to the spinal cord may occur in unstable fractures and represent a devastating event. MR imaging is critical to the assessment of acute trauma because it clearly depicts lesion location, extent and severity. These injuries include spinal cord edema, spinal cord contusion, intramedullary hemorrhage, and spinal cord transection. An important prognostic imaging characteristic, in addition to the spinal lesion, is the degree of spinal cord compression. 10%-20% of these patients do not survive to hospitalization, there is a 3% mortality during acute hospitalization. Most recovery starts within the first few weeks and plateaus in the first 3-6 months; younger age, decreased severity of impairment, incomplete injury, and lower level of injury are better prognostic signs.

<b>Title</b>	Orbital trauma and non-traumatic orbital emergencies.
<b>Authors</b>	L Cueto Alvarez. M. García Marín.

## **LEARNING OBJECTIVES**

1. Description of the anatomy of the orbit with its bony structures and their contents.
2. Evaluation of the main infectious, inflammatory, tumoral and vascular pathologies.
3. Description of orbital trauma and ocular involvement.

## **DISCUSSION**

### **INFLAMMATORY**

- Graves Disease.
- Idiopathic Inflammamatory Disease.
- Posterior Scleritis.
- Optic Neuritis.

### **INFECTIOUS**

- Preseptal Cellulitis
- Postseptal Cellulitis.
- Lacrimal Gland Infection.
- Subperiostic Abscess.
- Mucopyocele.

### **TUMORAL**

- Choroidal Retiboblastoma and Melanoma.
- Lymphoma.
- Optic nerve Meningioma.
- Neighborhood tumors.

### **VASCULAR**

- Orbitary Varix
- Cavernous Haemangioma.
- Carotid Cavernous Fistula

Trauma

Orbital Wall Trauma

Intraorbital Trauma

Globe Trauma

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Title	HEMORRHAGIC STROKE: DIAGNOSTIC WORK UP IN THE ER
Authors	Ane Ugarte (San Sebastián, Spain)

## HEMORRHAGIC STROKE: DIAGNOSTIC WORK UP IN THE ER

Spontaneous intracerebral hemorrhage (ICH) represents 10-15% of all stroke cases and it associates high morbidity and mortality rates. Early detection of high risk patients would be beneficial in deciding the management course and goals of care.

Aiming to help clinicians decide aggressiveness of treatment, some relevant radiographic characteristics in baseline CT must be described and reported, such as location and volume of the hematoma, possible etiologies and prognostic factors.

Location of the hematoma may influence treatment, as deep hematomas generally do not require surgical intervention, and may suggest the etiology and help us decide whether to complete the study with a computed tomography angiography (CTA).

Several scales have been published regarding etiology of the ICH and describing prognostic factors, which will also be reviewed.

<b>Title</b>	CT and contrast protocols in trauma, is there a consensus?
<b>Authors</b>	S. Wirth Department of Radiology Donaulsar-Klinikum, Deggendorf - Germany

### TEACHING OBJECTIVES:

- To understand the aim of dedicated radiological recommendations on polytrauma service
- To develop the attitude to promote the upcoming guideline
- To develop the attitude to promote scientific work on topics where ESER recommendations lack of scientific evidence
- To understand the basic recommendations as far as they are available at the moment of presentation (parts of the consensus finding process effect during the SERAU meeting 2019)

### DISCUSSION:

The ESER Society is an apolitical, non-profit organisation, exclusively and directly dedicated to promoting and coordinating the scientific, philanthropic, intellectual and professional activities of Emergency Radiology. The Society's mission at all times is to serve the health care needs of the general public through the support of science, teaching and research and the quality of service in the field of Emergency Radiology.

One particular aim of ESER is to advance and improve the radiologic aspects of emergent patient care and to advance the quality of diagnosis and treatment of acutely ill or injured patients by means of medical imaging.

Emergency Radiology covers the whole field including polytrauma service. Concerning the latter, particular past and present ESER board members have participated as a minority in several interdisciplinary guideline processes. However, the ESER board has observed the lack of dedicated separate recommendations for radiological polytrauma service. ESER has concluded to come up with such recommendations and hopes that this may be a start of bringing the corresponding diverse national and international radiological societies together in order to refine the statements, help together to gain them more visibility and in particular to strengthen the role of Radiology in upcoming interdisciplinary polytrauma guideline processes.

To give this start, ESER decided to come up with a White Paper/ European Guideline on radiological polytrauma imaging. Although the processes of both data preparation and consensus finding are similar to national guideline developments in many aspects, it was not top priority for

ESER to cover the topic in full. ESER clearly wants to be a (pro)motor of upcoming scientific work and tries to give suggestions for specific needs as well as for principal directions.

Currently the consensus finding is still running. There seem to be tendencies towards offering two different whole body CT protocols, one with a focus on lowering the dose (A: for the important portion of relatively less severely injured young adult polytrauma patients) and the other one with a focus on time/ precision (B: for all other PT patient groups). Protocol A may include repositioning of the arms for the body scan, low dose cervical spine and low dose split-bolus CT of the trunk. Protocol B may be done with a focus on time savings and scanning different phases of the contrast media distribution. First reading and interpretation should be driven more towards the ABCDE-approach of ATLS. As quality assurance und continuous improvement will get more important, respective parameters for useful assessment of key measurements have to be defined (e.g. total service time, time to first oral report, rate of missed relevant findings, etc.).

Although radiological polytrauma service covers children and Interventional Radiology, the White Paper/ Guideline will not focus on these topics. To overcome this in the future, ESER invites the corresponding national and international radiological (sub)societies. In addition, one will sometimes find a more or less distinct overlap with the topics of the diverse other radiological communities like MSK, Abdominal, Urogenital, and many more.

Title	Solid Organ Injury Key Imaging features for Key Decisions
Authors	Elizabeth Dick (London, United Kingdom)

**TEACHING OBJECTIVES**

- Understand advantages and limitations of different CT protocols in solid organ injury
- Help the clinical team to decide between surgical, interventional radiology and conservative management of the trauma patient by searching for: capsular breach, vascular damage (active bleeding, pseudoaneurysms, arteriovenous fistulas) and injuries extending to the hilum of the liver, spleen or kidneys.
- Understand the role of follow up imaging particularly with increasing trend to non operative management of trauma patients.

Title	MESENTERIC ISCHEMIA, NOT ALWAYS A STRAIGHTFORWARD DIAGNOSIS
Authors	Dra. Helena Cigarrán

## LEARNING OBJECTIVES

To briefly review the clinical features and pathophysiology of mesenteric ischemia.

To describe and depict the CT findings of the different types of acute mesenteric ischemia.

To announce the role of dual-energy CT on the diagnosis of mesenteric ischemia.

## DISCUSSION

Acute intestinal ischemia is an abdominal emergency occurring when blood flow to the bowel loops decreases because of mesenteric arterial hypoperfusion, impaired venous drainage or occlusion. It occurs in nearly 1% of patients presenting acute abdomen. Bowel ischemia is considered to be a transient and reversible event which begins with mucosal and mural infarction and may lead to irreversible transmural intestinal infarction and if untreated causes perforation, peritonitis and even death.

The causes can be occlusive (80% of all causes of intestinal ischemia) or non occlusive.

The occlusive ones are further classified as mesenteric arterial embolism (MAE), mesenteric arterial thrombosis (MAT) and mesenteric venous thrombosis (MVT). MAE (36-50% ) are due to embolic obstruction of the superior mesenteric artery, MAT are responsible of 50-60% of the intestinal ischemia and the most frequent cause of MVT (10-15%) is a bowel closed-loop obstruction.

Non occlusive mesenteric ischemia (NOMI) causes account for 20% of all intestinal infarcts and are due to hypovolemic shock, severe heart failure, abnormal blood concentration and vasoconstriction secondary to drugs.

The severity of injury depends on the extent of reduction in blood flow, the number of vessels involved, the duration of ischemia and the development of collateral circulation.

The prognosis was significantly worse after arterial mesenteric infarction than after venous mesenteric infarction.

The mortality rate is 50-69% due to the absence of specific symptoms or laboratory test for early detection which delays the appropriate management. Because of this, imaging studies play an important role in the diagnosis of mesenteric ischemia being multidetector CT the most sensitive

and specific diagnostic tool and it should be the first line imaging modality. Findings at multidetector CT can help exclude other causes of acute abdominal pain.

Acquisition of both non-contrast and biphasic contrast-enhanced CT images is necessary.

Unenhanced CT is required for the diagnosis of intestinal ischemia in order to evaluate submucosal hemorrhage, hyperdense or calcified thrombi and atherosclerotic plaque and to obtain a baseline attenuation measurement of the bowel wall. The arterial phase is performed for evaluating arterial stenosis, thrombi or emboli and occlusion. The venous phase is for evaluating venous patency and abdominal organs which may be affected by ischemia.

There is a significant correlation between the CT finding of bowel ischemia and the pathological damage.

The use of Dual energy CT (DECT) has improved the conspicuity between iodine-containing tissue and noniodine-containing tissue. Also DECT has the capacity to creating iodine material density images which allow better analysis of the differences in perfusion between tissues and can generate virtual unenhanced images avoiding the need for a separate unenhanced sequence as if conventional CT was performed, with the benefit of radiation dose reduction.

Title	GASTRODUODENAL EMERGENCIES: A CASE-BASED REVIEW
Authors	Elena Martínez Chamorro (Madrid, Spain)

## LEARNING OBJECTIVES

- To review briefly the anatomy and vascularization of the stomach and duodenum in MDCT images.
- To describe the most appropriate MDCT protocols for each clinical scenario.
- To depict the spectrum of imaging features of the different acute gastroduodenal pathologies and their complications in MDCT.

## DISCUSSION

Acute abdominal pain accounts for 5-10% of the visits to the emergency department. Due to its great availability and capacity, MDCT has become the first-line imaging modality used for evaluating abdominal pain in the acute setting.

The spectrum of gastroduodenal pathologies ranges from self-limiting processes to true life-threatening emergencies.

Although endoscopy remains an important tool for assessing acute gastroduodenal diseases, especially for the evaluation of the mucosa and biopsy sampling, it is more invasive and less available than MDCT.

MDCT can provide a rapid and accurate diagnosis, allows simultaneous evaluation of the entire abdominopelvic cavity and can demonstrate the various complications of gastric and duodenal pathologies, including perforation, obstruction, haemorrhage, and ischemia.

The main pathologic conditions can be classified into five groups depending of the mechanism of injury:

### 1. Inflammation, including gastritis, anisakiasis, emphysematous gastritis and peptic ulcer disease (PUD).

Gastritis and PUD continue to be common conditions, frequently secondary to *Helicobacter pylori* infection, nonsteroidal anti-inflammatory drugs or alcohol. Although upper digestive endoscopy is the mainstay diagnostic technique, many patients present to emergency department with unexplained acute abdomen and commonly undergo MDCT. Superficial ulcers are not typically well visualized on MDCT; however, deep or penetrative ulcers may be appreciated.

Secondary inflammation can result in adjacent wall thickening or other soft tissue changes. Extraluminal gas may be detected in cases of perforation.

Gastritis may be focal, segmental, or diffuse. When *Helicobacter pylori* is involved, it often results in circumferential antral wall thickening or focal thickening along the greater curvature of the stomach, that may simulate a gastric neoplasm. Because the CT appearances of gastritis and tumours can overlap, endoscopy and biopsy are often needed.

Emphysematous gastritis is a rare type of phlegmonous gastritis in which gas is found in the gastric wall due to infection by gas-forming organisms. It should be differentiated from other conditions as gastric emphysema, gastric pneumatosis and gastric ischemia.

## **2. Obstruction, for example due to PUD, malignancy, gastric volvulus, bezoar, Bouveret syndrome and superior mesenteric artery syndrome.**

The most common causes of gastroduodenal obstruction in adults are chronic PUD and malignant causes, especially gastric carcinomas for gastric obstruction and pancreatic tumours for duodenal obstruction.

Gastric volvulus is an uncommon acquired twist of the stomach on itself that can lead to gastric outlet obstruction, and can result in ischemia or perforation. It is usually associated with a large esophageal or paraesophageal hernia and divided into two main types, based on the axis of rotation: organoaxial and mesenteroaxial.

Other infrequent causes include bezoar, Bouveret syndrome and superior mesenteric artery syndrome.

There may also exist acute or chronic gastric dilatation without outlet obstruction, the latter more commonly in diabetic patients.

## **3. Perforation, including perforated ulcer, ingested foreign body, penetrating trauma.**

The most frequent cause of pneumoperitoneum with peritonitis is perforation of a peptic ulcer, gastric or more commonly duodenal. However, in about 30% of perforated peptic ulcers, no free intraperitoneal gas can be identified.

## **4. Haemorrhage, secondary to haemorrhagic ulcer, gastric varices, aortoenteric fistula (AEF) among other pathologies.**

Gastrointestinal bleeding affects 5-20% of patients with PUD. Patient presentation is variable, ranging from asymptomatic to hypovolemic shock, with hematemesis and hematochezia. The diagnosis and first line of treatment of a bleeding ulcer is typically made with upper endoscopy, being CT useful in cases where endoscopy is not clinically feasible or is nondiagnostic.

Aortoenteric fistula is an uncommon catastrophic cause of gastrointestinal haemorrhage. It is a communication between the aorta and the gastrointestinal tract, usually the third or fourth portion of the duodenum. The communication can be with the native aorta, generally aneurysm (primary



AEF) and more frequently as a post-surgical complication of aortic repair with or without a graft (secondary AEF). CT findings include ectopic gas, focal bowel wall thickening, breach of the aortic wall, extravasation of contrast material into the bowel lumen and leakage of oral contrast material into periaortic space.

**5. Ischemia.** Gastric or duodenal ischemia is rare due to their extensive vascularization. However, it can result from caustic ingestion or diffuse or localized vascular insufficiency (systemic hypotension, gastric volvulus, vasculitis or disseminated thromboembolism).

In summary, imaging, especially MDCT, plays an important role in diagnosis of gastroduodenal emergencies, often not suspected by the clinician. Radiologist should be aware of the CT features of the different acute gastric and duodenal disorders in order to achieve an appropriate diagnosis and guide the optimal management.

Title	Emergency radiology at a tertiary centre in Kenya
Authors	Mwango GN, Mutai J, Mugi B

**INTRODUCTION:**

Emergency radiology services in Kenya and most of sub-Saharan Africa are an emerging issue. Review of literature shows significant gaps in terms of infrastructure, health systems, dedicated workforce which greatly hinder efficacious delivery.

**OBJECTIVE:**

to describe access and availability of emergency radiology services, imaging modalities used, the spectrum of findings, challenges and the future of ER services in Kenya.

**DESIGN:**

retrospective cross-sectional study

**METHODS:**

review of cases presenting at two centres in Nairobi, Kenya. Patient demographics, clinical diagnosis, imaging modality and radiological diagnosis (where available) over a 2-year period will be analysed.

This paper will give a general overview of the current status of emergency radiology in Nairobi, what works, the challenges and way forward.

Title	Artificial Intelligence in emergency radiology
Authors	Pablo Valdés Solís DAIG Radiodiagnóstico. Agencia Sanitaria Costa del Sol. Marbella Presidente SERAM

## TEACHING OBJECTIVES

- Understand the concepts of artificial intelligence, machine learning, deep - learning, big data and related topics.
- Review the recent history of artificial intelligence systems that are being implanted in radiology.
- Understand the problems that arise when implementing and using artificial intelligence systems in radiology.
- Analyze some examples of artificial intelligence systems that can be applied in emergency radiology.

## EXPOSITION

New technologies such as artificial intelligence, "Big Data" or robotics have several decades of development, but it has been in recent years when they are being implemented in radiology. Some commercial examples, such as the IBM Watson system, have given a lot of visibility to these technologies, which have gone from being theoretical models to clear systems implanted in healthcare processes.

The large technology companies are making large investments in this field. The limits between classically sanitary companies and those of information technologies are fading in many cases, and we see in radiology the impact that the developments of IBM, Google or Nvidia will have.

The development of artificial intelligence technologies has suffered many ups and downs since the 50s of the last century. At present, we are at a time when artificial intelligence appears in scientific media, but also in specialized journals, with an exponential growth of publications. This has also been seen in Radiology. In this context, radiologists are seeing not only technologies that are sometimes difficult to understand, but many opinions in which the future of our profession is questioned. New technologies can pose a threat to many professions, but some see them as a clear alternative to radiologists.

However, we believe that this is a mistake, it implies an ignorance of the complexity that radiology supposes and overestimates the capacity of the machines. While it is true that the developments in Artificial Intelligence technologies have been extraordinary in recent years, there is still much to be understood in this field.

## SOME CONCEPTS

- *"Artificial intelligence (AI)" is the branch of computer science devoted to creating systems to perform tasks that ordinarily require human intelligence. Ai refers to systems that display intelligent behavior by analyzing their environment and taking actions - with some degree of autonomy - to achieve specific goals.*
- *"Machine learning" is the subfield of artificial intelligence in which algorithms are trained to perform tasks by learning patterns from data rather than by explicit programming.*
- *"Representation learning" is a type of machine learning in which no feature engineering is used.*
- *"Deep learning" is a type of representation learning in which the algorithm learns a composition of features that reflect a hierarchy of structures in the data.*
- *"Big Data". The term big data is used when traditional data mining and handling techniques cannot uncover the insights and meaning of the underlying data.*

## APPLICATIONS OF ARTIFICIAL INTELLIGENCE

Artificial intelligence systems are being applied in more and more fields related to radiology. In general, they can be divided into:

- Systems for image analysis.
- Systems for data analysis.

With regard to the **image analysis** systems are already being implemented that allow, in theory, to improve care processes:

- Detection of abnormalities in chest radiographs, such as systems for the detection of pneumothorax or pneumonia.
- Brain image analysis systems that allow the study of the stroke code. The FDA has already approved systems that automatically analyze the images and make a reading to assess the findings and determine if the patient is a candidate for specific treatment.

The **data analysis** systems are probably more applicable. They allow the study of all unit data (such as emergency medicine) and define the most optimized workflows for each patient.

## PROBLEMS AND DILEMMAS WITH ARTIFICIAL INTELLIGENCE

The **problems** can be both technical and those related to the development of the technique and its regulation.

The **technical problems** are challenges related to the programming or design of the technique. They are problems that appear in the learning phase, problems in the interpretation of the results (adversary images) or those due to the so-called "black box" (when the machine gives results that are difficult to interpret and due to its own autonomous learning process). ). Many of the limitations of artificial intelligence systems are due, according to experts, that **lack common sense**.

But many of the problems, sometimes more important, are due to the **lack of regulation** or to the variability of the regulations. But, regardless of the legal problems, these systems pose ethical problems. The systems end up manifesting the biases that are transmitted by those who teach them. That is why it is said that these systems end up being racist or sexist. Robotics and artificial intelligence are posing ethical dilemmas related to the impact of the results, the equity of health care or issues related to informed consent.

## CONCLUSION

Artificial intelligence systems have entered Radiology with a great impact. And they will stay. Their possible applications in emergency radiology are many and we will see them in a short time.

Radiologists must adapt to these systems, and be leaders in their implementation and use. For that, we must get involved in learning these systems, and adapt our training to what is already a new radiology.

<b>Title</b>	Emergency radiology 24/7: how is it managed around the world?	<b>IS</b>
<b>Authors</b>	ESER: Elizabeth Dick, London/UK USA: Jorge A. Soto, Boston/USA Spain: José M <sup>a</sup> Artigas Martín, Zaragoza/ES	

## SPAIN STILL DIFFERENT?

### *- Teaching objectives*

To present the opinion and preferences of the emergency physicians related to seven-day acute care diagnostic radiology service they receive.

To describe the Spanish model of seven-day acute care diagnostic radiology service called “guardias médicas” (medical guards), its main drawbacks and possible solutions.

### *Discussion / exposure*

## RESULTS OF THE SURVEY

The survey was sent to heads of Emergency Departments (ED) of hospitals of the Spanish National Health Service (SNHS), by mean of the Spanish Society of Emergency Medicine (SEMES).

A total of 429 completed surveys were received, including hospitals of different sizes, ranging from <50.000 consultations/year (21.5%) to > 200.000 consultations/year (15.3%).

The relevance of emergency imaging is reflected by the fact that 89.1% made more than 30% of their clinical decisions from an imaging test, and 48.8% made more than 50%-75% of their clinical decisions from an imaging test.

77.0% received simple radiography studies in less than 1 hour, but 87.3% without a radiology report. CT and ultrasound are routinely reported in 87,3% of cases.

The overall level of satisfaction with their radiology services was low in 37,6%, medium in 33.1%, high in 20.6% and very high in 8,7%.

## THE SPANISH MODEL

In Spain, the NHS provides most of the emergency care in a decentralized manner through the seventeen autonomous communities. In general, EDs in Spanish hospitals attend a number of urgent consultations roughly equivalent to half of their population. Of these, 70% correspond to medical-surgical general emergencies and 30% belong to mother-child area. Half of the general emergencies correspond to the medical area, 25% to the surgical area and 20-25% to traumatology. Regarding arrival time, 40% of patients come during the morning shift, 40% in the afternoon and 20% attend during night hours.

In last 25 years, Emergency Medicine (EM) has undergone a great development, becoming a differentiated medical specialty in most developed countries (not in Spain), with well-defined imaging support requirements in terms of quality and time. Emergency imaging has also evolved in these years, mainly CT, becoming an essential tool in ED. New demands from EM and technical developments have triggered the demand for emergent imaging.

In large centers, emergency imaging is usually provided by local employed radiologists, on site, on a 24-hour basis. As in other countries, in the last years, there have been troubles in recruitment of staff radiologists, challenging the provision of 24-hour, 7-days acute services by local radiologists. The solutions have been poor. Large centers have been able to maintain urgent activity with staff radiologists, but some small hospitals have been forced to eliminate night shifts and even afternoons. Urgent teleradiology is unevenly developed within the NHS.

### **MEDICAL GUARDS MODEL. WHAT IS IT?**

Emergency care is provided in Spain through 24-hour shifts called "guardias" (guards), encompassing regular work, from 8 AM until 3:00 PM, and emergency exclusive dedication from 3 PM to 8 AM. The regular work is scheduled in order to make it compatible with urgent assistance, but there are no rules on how to do it.

Regarding the 17 hours of exclusive emergency activity, the model includes two alternatives: physical or localized presence. In the first, the radiologist remain in the hospital, while in the "localized guard", the radiologist is available at home those 17 hours, and may be called from the hospital for those studies requiring his/her direct intervention, as ultrasound. A growing number of radiologists report CTscans from home, by means of workstations and laptops. This model is selected when urgent demand prevision is low or in small hospitals with shortage of radiologists.

On holidays and weekends, no regular work is scheduled and the 24 hour period is dedicated to emergency care. The radiologist is responsible for all the external urgency or emergency and for the continuity of care of inpatients. The model is mandatory for all staff members and does not differentiate functions according to the professional category or subspecialisation level.

## **DRAWBACKS OF THE GUARDS MODEL**

### **An old tale**

The model was created more than 50 years ago when urgent and emergent imaging activity was sporadic even in large centers. Therefore, the meaning of the work to be done was merely "job expectancy". Guards model has been feasible for years mainly in those tertiary hospitals, due to their special conditions at that time, of young staff, with abundance of residents, low salaries and need for a salary supplement. The guard has been for many years the only possible salary supplement in the Spanish NHS.

### **DECEPTIVE ECONOMY**

The approach of emergency care as "job expectancy" has very negative effects. Guard hours are very poor paid because they are administratively considered as complementary, not scheduled work. This promotes on doctors a passive, waiting "on demand" attitude which contrasts with the current reality of the EDs. Even for radiologists, emergency care has today moved to a model of intensive, high-skilled labor very far from "expectation of work".

Working 17 hours of "on demand" after having worked a regular shift of 7 hours is no longer sustainable for ER, whose activity between midday and midnight is continuous in most hospitals.

### **NEWER PHILOSOPHY**

Fortunately, true emergencies, ie, the life of limb threat, are not very frequent, but their arrival to ED tests the true quality of a hospital and stresses its care circuits. Radiology and radiologists must be there, integrated into the multidisciplinary teams involved in acute medicine (trauma, stroke, sepsis, etc.).

Responsibilities of the emergency radiologist are well defined and today we can talk about the "biology of ER"<sup>1</sup>. Being integrated into emergency environment means that emergencists consider us part of their team, sharing their philosophy and using their same guidelines.

SERAU/SERAM/ESER should promote the development of ER core common competencies ("skill mix") to be acquired and maintained by all radiologists involved in ER, including guard rota, regardless of their polyvalent or subspecialized regular profile.

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<sup>1</sup> Rosen, P. The biology of emergency medicine. JACEP 1979;8:200-3



<b>Title</b>	<b>MSK emergencies: what not to miss</b>
<b>Authors</b>	Alejandro García de la Oliva. H. Universitario Virgen Macarena Sevilla

## LEARNING OBJECTIVES

- To Know specifics signs of musculoskeletal pathologies in emergencies
- To define imaging recommendations

## DISCUSSION

The request for studies related to the musculoskeletal system are increasingly frequencies in emergencies

This chapter has been divided into urgent musculoskeletal pathology of an inflammatory-infectious, traumatic and vascular nature.

No reference is made to fractures and their multiple classifications, which would exceed the length and purpose of this chapter.

### 1. Acute osteomyelitis

Osteomyelitis can develop via three routes: hematogenous, direct implantation or contiguous spread.

Bone infection requires an MRI scan that allows early detection of bone contamination and more accurately determines the extent of the process. Ultrasound, MDCT and plain radiographs are useful tools in emergencies

Routine studies with intravenous contrast should be performed to differentiate cellulitis, phlegmon and abscess and the detection of sinus tracts.

A case with multiple extramedullary collections with liquid-fat level is presented as a rare but specific sign of bone infection.

### 2. Necrotizing fasciitis

Infection of soft tissue with rapidly progressive necrosis of subcutaneous cell tissue and fascia

Associated with risk factors (diabetes, immunosuppression, alcoholism, drug abuse) and high mortality.

Early diagnosis and surgical debridement associated with improved prognosis

MRI more accurately determines the extent of the process

Soft tissue gas is a late and inconstant sign

The existence of the following signs strongly suggests necrotizing fasciitis: Extensive involvement of the deep intermuscular fascia thickness of the deep fascia 3 mm or more and multi-compartmental spread

### **3. Vertebral osteonecrosis (Kümmel disease)**

Uncommon disease secondary to ischemia and late necrosis after vertebral compression.

Osteoporosis is the most important risk factor.

Plain radiograph: intravertebral air collection called “vacuum cleft sign”

CT: air collection is more heterogeneous and irregular than radiographs

MRI: vacuum cleft sign is low signal with all sequences. A liquid collection as a well-defined area of low T1 signal and high T2 signal is called “the fluid sign”.

Intravertebral liquid and gas can be seen at the same time.

Intravertebral air suggests advanced stage of the disease and risk of collapse of adjacent vertebrae.

### **4. Traumatic dislocation of the knee**

knee dislocation is a serious emergency due to its association with neurovascular injuries.

Vascular integrity should be assessed with CT angiography whenever a dislocation of the knee is suspected. Spontaneous reduction can falsely look like a benign lesion.

The popliteal artery is injured in approximately 20% to 40% of all knee dislocations. Vascular damage is most common in anterior and posterior dislocations.

Computed tomographic (CT) angiography is a noninvasive and rapid imaging technique that shows high sensitivity and specificity in the detection of arterial injuries in the extremities being the conventional arteriography the current imaging method of choice.

The CT angiographic signs of arterial injuries in the extremities are active extravasation of contrast material, pseudoaneurysm formation, abrupt narrowing of an artery, loss of opacification of a segment of artery, and arteriovenous fistula formation

Deep venous thrombosis has also been associated with knee dislocations. A Doppler ultrasound is often recommended to rule out deep venous thrombosis.

## **5. Posttraumatic pseudoaneurysm**

Infrequent cause of vascular injury from violent or iatrogenic trauma

Can develop a spontaneous thrombosis or be complicated by compression of neighboring structures, infection or rupture

DSA is the “gold standard” for imaging traumatized vessels

Describe the neck between the injured artery and the pseudoaneurysm is the key to diagnosis

Ultrasound: requires competence and experience. Defines size, lobes and neck length-width. Color Doppler: Yin-yang sign. Duplex Doppler: “to and fro” flow is specific for pseudoaneurysm

CECT: Quick and accurate method for vascular examination. Identifies concomitant bone and joint injury and extravasation of contrast into soft-tissue

The size of the pseudoaneurysm determines the treatment with selective percutaneous or endoluminal embolization. Radiologic intervention is preferred over surgical arterial repair.

## **6. Paget-Schroetter syndrome**

Infrequent or under-diagnosed disease.

Compression of the axillosubclavian vein by muscular, skeletal or ligamentous structures

Young and healthy patient in dominant limb with important physical activity particularly when raising arm over head.

The recommended tool for venous evaluation is ultrasound, especially useful for visualizing thrombosis or abnormal flow with lack of respiratory variation with stress views

CECT: 3D reconstruction and collaterals in chest wall

The existence of collaterals indicates significant narrowing or thrombosis.

Treatment: surgical correction of the anatomical abnormality.

Title	Vascular emergencies: what not to miss
Authors	Prof. Dr. Uli Linsenmaier, MD, PhD, Munich, GERMANY

### LEARNING OBJECTIVES

1. To demonstrate general principles of diagnosis, angiography and acute interventional treatment options in patients with traumatic and non-traumatic vascular emergencies
2. To analyze the diagnostic work-up and patient management, as well as indications and selection for interventional treatment
3. To discuss operative and non-operative treatment options for bleeding control, vascular injuries and treatment of parenchyma organ injuries

Vascular emergencies can cause life threatening clinical conditions and need a quick and thorough work –up as well as immediate triage for operative and/or non-operative treatment. Angiography and acute radiology interventions allow in carefully selected patients (i) bleeding control, (ii) embolization of vascular bleeding sites and (iii) non-operative treatment of parenchyma organ injuries.

This talk will cover acute radiological interventions of the thorax and abdomen in patients after trauma. The diagnostic work-up, patient selection and indications for interventional treatment are discussed. Accessible vascular territories, methods of balloon occlusion and embolization of vascular bleeding sites are presented, as well as non-operative treatment options of parenchyma organ injuries and corresponding scoring systems. In addition complex interventional treatment options of bleedings after pelvic trauma are presented.

Title	( O5) Ultrasonography in the diagnosis of Surgical Acute Abdomen in a Nigerian Tertiary Health Facility.
Authors	I. Aliyu <sup>1</sup> , A.U. Hamidu <sup>1</sup> , A. Ahmed <sup>2</sup> , F.O. Jinadu <sup>3</sup> , C.M. Asaleye <sup>4</sup> .
Centre	1Department of Radiology, Ahmadu Bello University Teaching Hospital (ABUTH), Shika- Zaria; 2Department of Surgery, Ahmadu Bello University Teaching Hospital (ABUTH), Shika- Zaria; 3Radiology Department, College of Medicine, Lagos State University Teaching Hospital (LASUTH), Ikeja; 4Department of Radiology, College of Health Sciences, Obafemi Awolowo University, Ile -Ife.

**Purpose:** To determine the spectrum of diseases of surgical acute abdomen by ultrasonography and comparing the ultrasound diagnosis with the clinical and surgical diagnoses in a low resource setting where emergency computed tomography is not readily available and accessible due to its high cost and concerns for exposure to ionizing radiation.

**Methods and Materials:** A prospective observational study conducted from June to November 2017 on consecutive patients presenting with acute abdomen to the Radiology Emergency Unit for abdominal ultrasonography. The ultrasound findings were compared with the clinico-surgical findings. Chi-square test was used for correlation and Kappa statistics was used to measure degree of agreement. Diagnostic performance markers included sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and diagnostic accuracy.

**Results:** The most common surgical acute abdominal conditions included appendicitis (27.5%), bowel perforation (21.7%) and ectopic pregnancy (12.5%). Ultrasonography had an overall sensitivity of 80.8%, specificity of 99.1%, PPV of 89.0%, NPV of 98.3% and accuracy of 97.6% while clinical (pre-Ultrasound) diagnosis had overall sensitivity and specificity of 65.0% and 97.7% respectively. There was significant correlation between ultrasound and surgical diagnosis of most of the acute abdominal conditions ( $p < 0.001$ ). Ultrasound and surgical diagnosis of most of the acute abdominal conditions showed beyond chance Kappa ( $k$ ) agreement ( $0.20 < k \leq 1.00$ ).

**Conclusion:** Ultrasonography should be part of the initial emergency evaluation of patients with acute abdomen as it has shown to have a higher concordance with the surgical diagnosis than the clinical (pre-Ultrasound) diagnosis alone.

Title	( 0145) Use of the secondary intracerebral hemorrhage score. Is it useful?
Authors	B. Lumbreras-Fernández, F. Gonzalez Tello, N.A. Almeida Arostegui, M. Vicente Redondo, I. Bermúdez-Coronel Prats, A. Vicente Bartulos.
Centre	Hospital Ramón y Cajal.

**Purpose:** Retrospective implementation of the secondary intracerebral hemorrhage (SICH) score in a third level hospital and evaluation of the suitability of our imaging protocol.

**Methods and Materials:** We retrospectively applied this scoring system to the patients with non traumatic intracerebral hemorrhage presented between August and October 2018 in our emergency department, where there was no previous imaging protocol consensus.

We compared the results from neurovascular studies with CT angiography (CTA), digital subtraction angiography (DSA) or both, according to the score groups.

**Results:** We found 38 patients meeting the suitable criteria. A neurovascular study was performed in four cases from the score 1 group (10 patients), seven from the score 2 group (17 patients), three from de score 3 group (five patients) and in the only patient with score of 4. It was not performed in any of the patients with score 0 (five cases). Underlying vascular lesions were found only in two pacients, both from the score 3 group. We have not proceeded correctly according to this score, since we did not performed a neurovascular study on every patient in the score 1, 2 and 3 groups with the consequent risk of underdiagnosis of secondary hemorrhage.

**Conclusion:** It is important to recognize those patients with high risk of SICH and to perform a neurovascular study on them in order to find and treat possible underlying vascular lesions. The SICH score can be helpful to stablish an imaging protocol in the radiology emergency department.

Title	( O300) Abdominal radiography. Have we changed anything?
Authors	I. Dieste Grañena, I. Suñen Amador, M. Ciotti Lopez, J. García Maroto, C. Rodriguez Torres, J. Artigas Martin.
Centre	Hospital Universitario Miguel Servet.

**Purpose:** Analyzing the diagnostic yield of abdominal radiography (AR) in the emergency services (ED), correlating their findings with other imaging tests performed and the impact of their findings on the evolution and subsequent management of patients.

**Methods and materials:** Retrospective study of patients treated in our ED to whom RA was performed. Two periods of 1 month were analyzed (January 2012 and June 2017). The reports were reviewed, classifying the findings into 3 categories: normal, pathological or nonspecific. We collected information about additional radiological studies (ultrasound, CT or both) performed in the first 72 hours and the progress of patients (discharge, admission, surgery, ICU, etc).

**Results:** A total of 1804 patients were included, of which 1405 (77.8%) consulted for abdominal symptoms. The radiological findings were normal (ARN) in 31.8% nonspecific (ARI) in 57.3% and pathological (ARP) in 10.9%. An additional imaging test was performed on 28.3% (86.9% with ARN / ARI and 13.1% with ARP). They showed additional findings 47% of patients with ARN, 53.5% of ARI and 91% of ARP. Were discharged from the ED 79.1% of patients with ARN, 67.2% of ARI and 61.8% of ARP. 19.4% of patients with ARN were admitted.

**Conclusion:** The RA has a low diagnostic yield maintained over time. When it identifies pathology, it requires another diagnostic test. It is not useful to decide admission / discharge. However, it is a common test in patients with abdominal and even extra-abdominal symptomatology.

Title	( 0309) Cerebral Computed Tomography Angiography (CTA) vs Cerebral Angiography in the characterization of arteriovenous malformations (AVMs) with haemorrhagic presentation.
Authors	C. Zwanzger, A. López, D. Campodónico, J. Blasco, L. San Roman, J. Macho.
Centre	Hospital Clínic de Barcelona.

**Purpose:** Cerebral angiography is the gold standard for the diagnosis of cerebral AVMs with haemorrhagic presentation. However, it is an invasive, not widely available study and it implies radiation to the patient. The purpose of this study is to establish the correlation between CTA and cerebral angiography for the characterization of these AVMs.

**Methods and Materials:** We made a retrospective analysis of a prospective database of patients who had cerebral bleeding due to an AVMs from January 2007 to December 2012. We reviewed radiologic variables such as type, localization and size of haematoma and characteristics of the AVMs (size, localization, deep venous drainage (DVD), eloquent area involvement (EAI), presence of any aneurism; intranidal and flow aneurisms among others). Two blinded neuroradiologists read by consensus the non-enhanced computed tomography (NCECT) images and another two the cerebral CTA and angiography images.

**Results:** 22 patients were included in the study. CTA classified 15 out of 16 cases as AVM <3 cm, with a sensitivity (S) of 93,75%. All cases with DVD and EAI were detected (S 100%). Presence of any AVM related aneurysms was detected in 13 out of 15 patients (S 86,6%); 7 out of 9 had intranidal (S 77,78%) and 6 out of 9 had flow aneurisms (S 66,67%).

**Conclusion:** CTA had high sensitivity in the characterization of cerebral AVMs regarding size less than 3 cm, eloquent area, deep venous drainage and any related aneurysm. However, CTA sensitivity was lower for the assessment of the presence of nidal and flow aneurysms.



Title	(O364) AOSpine Thoracolumbar Classification System: Does the experience of the radiologist influence?
Authors	J.J. García Maroto, I. Suñen Amador, M. Ciotti López, I. Dieste Grañena, A.C. Vela Marín, J.M. Artigas Marín.
Centre	Hospital Universitario Miguel Servet.

**Objective:** To analyze the degree of interobserver reliability and intraobserver reproducibility in the classification of traumatic thoracolumbar vertebral fractures according to the AOSpine classification.

**Methods and materials:** Computed tomography (CT) images of 60 patients with traumatic thoracolumbar vertebral fractures were analyzed. Two radiologists with different experience in spinal pathology (a neuroradiologist and a radiology resident) classified the fractures according to the model proposed by AOSpine evaluating each fracture on two occasions with a minimum interval of two months between them. The Kappa coefficient was used to evaluate the concordance between evaluators (global, by types and subtypes) and to obtain the intraobserver reproducibility.

**Results:** The interobserver reliability was excellent when considering the fracture type (A, B, C), with a  $k = 0.803$  (0.712-0.9). The interobserver agreement when considering the subtypes was moderate,  $k = 0.606$  (0.306-1) with a maximum agreement in A0 ( $k = 1$ ) and C ( $k = 0.9$ ) subtypes. The intraobserver reproducibility was excellent for both evaluators ( $k = 0.859$  and  $0.802$ ).

**Conclusions:** The classification of thoracolumbar vertebral fractures using the scheme proposed by AOSpine has adequate levels of concordance and reproducibility for use by radiologists with different levels of experience. Future studies with a greater number of cases and observers could get more representative results.

Title	(0368) Preliminary single-centred study on the short and medium-term prognosis of patients with acute calculous cholecystitis treated by percutaneous cholecystostomy
Authors	M.J. Gayán Belmonte, J.M. Plasencia Martínez, H. Pérez Templado Ladrón De Guevara, A. García Chiclano, A. Moreno Pastor, A. Blanco Barrio.
Centre	Hospital Universitario J. M. Morales Meseguer.

**Purpose:** To assess the prognosis after percutaneous cholecystostomy in acute calculous cholecystitis (ACC).

**Methods:** Patients with non-emergency operable ACC were consecutively collected during 2013-2015. Differences in the clinical course of patients treated by antibiotics (pTA) versus percutaneous cholecystostomy (pTPC) were analyzed by Student's T and Chi<sup>2</sup> tests.

**Results:** 53 (61.6%) patients underwent cholecystostomy and 33 (38.4%), antibiotics, with similar mean age ( $79.75 \pm 11.54$  vs  $76.52 \pm 11.60$  years, respectively;  $P=0.210$ ). 47 (54.7%) were men. Women ( $n=30$ , 56.6%;  $P=0.08$ ), patients with comorbidities (41-74.5%- vs 12-38.7%-;  $P=0.001$ ) and radiologically complicated ACC (19 -90.5%- vs 34 -52.3%-;  $P=0.002$ ) underwent more frequently cholecystostomy. However, only 13 pTPC (26.5%) met criteria for severe type III cholecystitis.

Two patients (2.8%) suffered from acute respiratory failure during cholecystostomy and 1 (1.9%), from catheter malpositioning.

Both groups clinically improved in the first day (31-93.9%- pTA and 46 -86.8%- pTPC;  $P=0.292$ ). However, of 36 (73.5%) pTPC with no criteria for severe cholecystitis, 7 (19.4%) died on admission or required ICU-admission, compared to 0 (0%) of those pTA ( $P=0.075$ ). pTPC were admitted longer ( $17.13 \pm 9.04$  vs  $9.91 \pm 5.72$  days;  $P<0.001$ ), even when comorbidities were absent ( $18.50 \pm 9.07$  vs  $9.16 \pm 5.64$  days;  $P=0.001$ ).

3 pTA and 7 pTPC were re-admitted for ACC. 13 pTA (34.8%) and 4 pTPC (7.5%;  $P=0.001$ ) underwent surgery, with more delay in the latter ( $49.17 \pm 39.59$  vs  $101.6 \pm 49.73$  days,  $P=0.035$ ).

**Conclusion:** Although cholecystostomy as ACC treatment is safe, it increases the admission time and may reduce the chances and delay definitive treatment. Short-term prognosis for no-severe ACC may be worse for cholecystostomy than for antibiotics.

Title	(O383) Performance of portal-venous phase ct in acute arterial mesenteric ischemia.
Authors	M. D'annibale, R. Cianci, A. Delli Pizzi, B. Sessa, B. Seccia, R. Basilico.
Centre	Department of Neuroscience Imaging and Clinical Sciences - S.S. Annunziata Hospital.

**Purpose:** to evaluate the performance of portal-venous phase CT in the detection of acute arterial mesenteric ischemia (AAMI) and to investigate if the arterial phase may be omitted in order to decrease the total CT dose delivery.

**Methods and materials:** we included 19 patients with proved AAMI who underwent multiphasic CT (unenhanced-UE, arterial phase-AP and portal-venous phase-PVP) in the emergency setting. A control group of 20 patients with different causes of acute abdomen was randomly selected for comparison. Three readers with different experience in abdominal imaging reviewed all CT images in three different reading sessions: A. PVP, B. PVP and AP, C. PVP and UE. Diagnostic performance for the detection of AAMI (presence of arterial thrombi and signs of bowel ischemia/infarction) for each reader and each reading session was evaluated by means of ROC curve analysis (AUC). Interobserver agreement was calculated.

**Results:** all readers achieved high diagnostic performance values when interpreting PVP images (AUC 0.833, 0.917 and 0.792 respectively for the detection of arterial thrombi and AUC 0.896, 0.947 and 1 respectively for the detection of signs of bowel ischemia/infarction). No significant differences were obtained when adding AP images in set B and UE images in set C. Interobserver agreement was excellent for both arterial thrombi and ischemia/infarction signs in all reading sessions.

**Conclusion:** Portal venous phase acquisition is effective for diagnosis of acute arterial mesenteric ischemia; the arterial phase acquisition is not mandatory to achieve a final diagnosis and to plan the proper patient management.

Title	(O484) MR role in the assessment of patients with pregnancy related bleeding.
Authors	F. Iacobellis, M. Di Serafino, M.G. Scuderi, G. Ponticiello, T. Cinque, L. Romano.
Centre	"A. Cardarelli" Hospital.

**Purpose:** Pregnancy related bleeding is a serious complication that may compromise mother and fetus survival.

Ultrasound is the imaging method widely accepted for the first line evaluation, however, it suffer from interobserver variability and low panoramcity if compared with MR.

MR has gaining an emerging role in the last few years, especially in the evaluation of patients with abnormal placental implant, as in these patients the best predelivery approach is still matter of debate.

**Methods and Materials:** Nineteen pregnant patients referring to the ED for abnormal vaginal bleeding, and with doubtful ultrasound findings, were investigated by unenhanced MR.

Imaging protocol includes the following sequences: T2 W SSFSE in axial, sagittal and coronal planes, T1W Fat Sat LAVA without IV contrast administration.

**Results:** Nine patients were diagnosed as having placenta total previa, 5 with placenta marginal previa, 1 with low-lying placenta, and 4 with normal implant. Of them, at MR 7 patients were diagnosed as having placenta accreta, 3 placenta increta, 3 percreta, and 6 without implant abnormalities. MR findings were fully confirmed at the delivery and histology in 17/19 (89,4%) patients, whereas were partially confirmed in 2/19 (10,5%) of cases.

**Conclusion:** MR is indicated in the emergency diagnostic workup of patients with pregnancy related bleeding to obtain a panoramic evaluation of the placental implant abnormalities and to properly orient the management with the aim to reduce the rate of massive bleeding and hysterectomy at the delivery.

Title	(0592) Pilot study on diagnosis and prognosis differences between emergency non-operable calculous vs acalculous acute cholecystitis
Authors	M. Gayán Belmonte, J.M. Plasencia Martínez, A. García Chiclano, A. Moreno Pastor, M. Huertas Moreno, A. Blanco Barrio.
Centre	Hospital J. M. Morales Meseguer.

**Objective:** To assess diagnosis and prognosis differences between calculous (CAC) and acalculous acute cholecystitis (AAC).

**Methods:** Patients with emergency non-operable CAC and AAC were consecutively recruited during 2013-2015. Differences in diagnostic features and clinical course of patients treated with antibiotics (pTA) versus percutaneous cholecystostomy (pTPC) were analyzed by Student's T and Chi<sup>2</sup> tests.

**Results:** 101 patients were recruited. The mean age was  $78.13 \pm 12.32$  years. 52 patients (51.2%) were men.

Diagnosis was performed by ultrasound in 79.2% (80 patients) and by ultrasound plus Computed Tomography in 12.90% (13 patients). 24.7% (25 patients) suffered from complicated cholecystitis at onset (gangrenous, perforated, both or emphysematous).

61 patients (60.4%) had one or more Charlson-index comorbidities. 10 patients (9.9%) had AAC. Of these, 4 (40%) were diabetic and none had been previously hospitalized for any other reason.

In AAC, gallbladder wall thickness was greater ( $6.13 \pm 3.01$  vs  $4.66 \pm 1.96$  mm), but without reaching significance ( $P=0.136$ ). Maximum gallbladder diameter was similar ( $43.22 \pm 9.10$  vs  $44.50 \pm 8.76$  mm;  $P=0.675$ ). Although not significantly ( $P>0.05$ ), vesicular wall stratification (90.7% vs 80.0%), perivesicular fat inflammation (84.6% vs 75%) and perivesicular collections (21.2% vs 0%) prevailed in CAC.

Cholecystostomy was performed in 86.7% (33/86) CAC and in 50% (5/10) AAC. Clinical improvement: 31/33 (93.9%) pTA and 46/53 (86.8%) pTPC ( $P=0.292$ ) in the CAC-group, and 4/5 (80%) and 5/5 (100%) in the AAC-group, respectively ( $P=0.292$ ).

**Conclusion:** CAC seems to associate more perivesicular inflammation than AAC. Clinical improvement was not significantly better in AAC treated with cholecystostomy compared to antibiotherapy. The diagnosis was mostly made by ultrasound.

Title	(0629) How many years are required to correctly diagnose apendicitis by ultrasound?
Authors	I. Suñen Amador, M. Ciotti López, I. Dieste Grañena, J. García Maroto, J. Artigas Martín.
Centre	Miguel Servet Hospital.

**Purpose:** Acute appendicitis is the most common acute abdominal illness. The aim of our study was to evaluate the performance of ultrasound in the diagnosis of acute appendicitis depending on the year of training of our residents.

**Methods and Materials:** We retrospectively collected 161 cases of urgent appendectomies in adults (>14 years) studied with abdominal ultrasound performed by radiology residents. Sonographic findings included: normal appendix, direct signs of appendicitis (appendix >6 mm, non-compressible and hyperechogenicity of fat), presence of appendicolite, free fluid and/or collection. When appendix was not visualised, the presence or absence of inflammatory signs were included. Findings were classified according to the year of residency and appendicitis was confirmed by pathology reports. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were defined and compared.

**Results:** 91.30% patients had an appendicitis diagnosis in pathology reports. The sensitivity of ultrasound was 82.19% (95% IC: 75.64-88.74) and specificity increased from 20.00% for R2 to 71.43% for R4. The global PPV and NPV were 94.49% and 23.53%, respectively. The number of not visualised appendices decreased with the experience of the resident from 14.29% to 6.35%. In 20% cases of not visualised appendix, indirect signs were observed. Negative appendectomy rate was 8.70%.

**Conclusion:** Most residents are required to perform ultrasound examinations daily or weekly, improving their performance progressively with the year of residency. We found an increment in specificity in the ultrasound diagnose of acute appendicitis, a high sensitivity and accuracy but a low VPN.

Title	(0641) Alvarado score: ¿is it enough to avoid ultrasound imaging?
Authors	M. Ciotti López, I. Suñén Amador, I. Dieste Grañena, J. García Maroto, J. Artigas Martín.
Centre	Hospital Universitario Miguel Servet.

**Purpose:** Alvarado score uses clinical-analytical parameters to evaluate the probability of acute appendicitis and ultrasound is the first-line diagnostic imaging method. The aim of our study was to determine if Alvarado values > 9 and ultrasound associate similar positive predictive value (PPV).

**Methods:** We reviewed 154 cases of appendicitis in adults studied with ultrasound and operated on during a year. All cases had pathological confirmation. The Alvarado scale was applied stratifying into three levels of probability (low: 1-4, medium: 5-8, high: 9-10). Sensitivity, specificity and predictive values were calculated for the different groups (1 to 4 vs. 5 to 10, 1 to 6 vs. 7 to 10 and 1 to 8 vs. 9 to 10 points). Finally, the results of the ultrasound and the Alvarado score were contrasted in patients whose score was >9.

**Results:** We obtained sensitivity and specificity of 88% and 18% respectively, for Alvarado values of <4, sensitivity of 67% with specificity of 45% for <7, and sensitivity of 23% with specificity of 90% for patients with score >9. Sensitivity and specificity of the ultrasound for the entire sample was 95% and 36%. The PPV for Alvarado score > 9 was 97% [95% CI; 92% -99%], similar to ultrasound in that same group.

**Conclusions:** Alvarado scale is a good screening test for values <4, owing to its high sensitivity, while for values > 9 it has a high specificity and a PPV similar to ultrasound, a fact that questions its performance in this high-risk group.

Title	(0696) Impact of a third survey on the radiological assessment of politraumatized patients.
Authors	C. Cruz-Conde, J. Alonso, I. Navas, E. Martínez, L. Ibáñez, S. Borruel.
Centre	Hospital 12 de Octubre.

### Purpose

- To explain how a third survey is performed.
- To analyze the impact of radiological errors and identify risk factors in politraumatized patients.

**Methods and materials:** Once a politraumatized patient arrives at the hospital and is stabilized, we perform a CT scan to identify life-threatening injuries, playing a key role in the primary and secondary survey. 24-48 hours after the trauma, a third survey is performed, where expert radiologists review the CT scan images to assess if the study was properly performed and search for any errors that were committed.

We reviewed the politraumatized patients that were admitted to our hospital during 6 months from February 2018 to July 2018. We collected data such as time of the CT scan, experience of the radiologist (staff vs resident), energy of the trauma and severity score for all of the patients. We also reviewed the different types of errors committed during the first evaluation of the CT scan. We analyzed possible factors that may have contributed to any errors and we measured the impact in the patient's management.

**Results:** From 94 politraumatized patients, 84 met the criteria to undergo a third survey of the CT scan. 127 errors were identified: 89 non-described errors, 25 interpretation errors, 7 non-traumatic errors and 6 transcription errors. The third survey had an impact in the management of 20 patients.

**Conclusion:** A third survey may find radiological errors that can have an impact on the outcome of the patient.



