Current State of Abdominal Computed Tomography Performed in Emergency Department of a Tertiary University Hospital and Development of a Preliminary Interpretation Checklist

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Purpose: Abdominal computed tomography (CT) is a widely recognized method to diagnose patients with acute abdominal pain in the emergency departments (EDs). We aimed to investigate the current state and interpretations of abdominal CT performed in the ED of a tertiary university hospital.

Methods: This was a retrospective study based on an abdominal CT database and medical records of patients over 15 years of age, who had visited our ED between January 1 and December 31, 2013. The data collected included CT types, final interpretations, characteristics of the patients, and location of pain at the time of CT.

Results: A total of 1,978 abdominal CTs were performed among 1,923 patients during the research period. The most frequent organs involved in the major diagnosis were those in the urinary system, followed by the appendix, liver, large intestine, and gallbladder. The most frequently interpreted diagnoses in these organs were in the order of urinary stone, appendicitis, liver cirrhosis, infectious colitis, and acute cholecystitis. The most frequent location of pain was the right lower quadrant (429 cases, 21.7%), and the most frequently performed CT types were contrast-enhanced abdominal and pelvic CT (1,260 cases, 63.7%).

Conclusion: Various interpretations were derived based on the abdominal CTs, ranging from critical to mild diseases and from common to rare diseases. Based on this study, we have developed a preliminary interpretation checklist for abdominal CTs.

Key Words: Computed tomography, Emergency service, Hospital, Interpretation

Introduction

In the last 10 years, the number of adult patients receiving computed tomography (CT) in the emergency departments (EDs) of university hospitals has increased at a much higher rate than the increase in the total number of patients presenting at EDs¹⁻⁳. However, the increase rate of CT performance for pediatric patients is marginal compared with that for adult patients, which is considered to reflect the fact that pediatric patients are more vulnerable to the harmful effect of radioactivity⁴. Despite the controversy on these harmful effects, CT has taken firm roots as an essential test for image-based diagnosis in EDs. Intravenous pyelography used for the diagnosis of renal colic, nuclear medical tests used for the diagnosis of pulmonary thromboembolism, and angiography tests for assessment of the structures of major blood vessels have already been replaced by CT to a considerable degree.

Abdominal CT is widely used as a standard test to establish a diagnosis in patients suspected of traumatism, acute
Article Summary

What is already known in the previous study
Abdominal computed tomography (CT) is a widely recognized method to diagnose patients with acute abdominal pain in the emergency departments.

What is new in the current study
Various interpretations were derived based on the abdominal CTs, ranging from critical to mild diseases and from common to rare diseases. Based on this study, we have developed a preliminary interpretation checklist for abdominal CTs.

appendicitis, diverticulitis and pancreatitis and is particularly excellent diagnostic method in patients who visit EDs for acute abdominal pain5,6. There are many cases in which accurate final diagnoses are difficult to obtain for patients with acute abdominal pain based only on medical history, physical examination and a blood test, and thus the role of abdominal CT is very important to accurately diagnose life-threatening diseases7,8. Indeed, performance of abdominal CTs on patients with acute abdominal pain in the ED has been reported to not only reduce the hospitalization rate but to also help promptly determine whether or not to perform surgical interventions9.

The major objective of this study was to investigate the current state of abdominal CTs performed in the ED and the patterns of final interpretations according to different organs based on the abdominal CT results. The secondary objective of the study was to develop a preliminary interpretation checklist for abdominal CT based on this analysis, which can be used to accurately diagnose emergent diseases without neglecting rare but critical diseases. In most of EDs, residents have not been able to systematically approach to CT interpretations due to absence of education or shortage of time. Therefore, we intend to use this checklist as an educational tool for emergency medicine residents.

Materials and Methods

We analyzed the database of abdominal CTs performed on patients (aged ≥ 15 years) who visited ED of our hospital for the period from January 1 to December 31, 2013. Abdominal CT was performed differently according to the target organs for a total of seven CT types: enhanced abdominal pelvic CT, non-enhanced abdominal pelvic CT, liver dynamic CT, biliary pancreas CT, urography CT, traumatic abdominal CT and appendix CT.

We retrospectively investigated the medical records associated with the CT database. Analysis was conducted on the final interpretations and diagnoses according to the target organs of all abdominal CTs performed by prescriptions of ED residents or attending physicians from January through December 2013. In the cases of more than two diagnoses, the more urgent or critical disease was recorded as the major diagnosis. The total number of CTs performed over the year was also calculated, excluding CTs performed on children under the age of 15. As the purpose of this study was to specifically analyze the abdominal CT database and interpretations, multiple CTs performed on the same patients were considered as separate cases. The presence of abdominal pain at the time that the patients visited our hospital was also documented through analysis of the medical records, and the locations of the pain (if present) was also recorded. The group with abdominal pain was further classified into two subgroups according to the presence or absence of trauma. For each group, it was noted whether or not the patient was discharged from our ED or if they were subsequently hospitalized in either our institution or another. We also analyzed the time and days in which the CTs were performed in ED according to weekdays (Monday through Friday) versus holidays (weekends and public holidays) and time slots (day, evening, night). The time assigned for “day”, “evening” and “night” corresponded to the period from 8 am to 4 pm, from 4 pm to 12 am the next day and from 12 am to 8 am respectively.

Continuous variables are expressed as means with standard deviations, or as medians and full ranges if the assumption of a normal distribution was violated. Categorical variables are presented as numbers and percentages.

Since this study was a retrospective research in nature relying on medical records and interpretations of abdominal CTs, the institutional review board (IRB) approved our review of patient data and waived the requirement for obtaining informed consent. Finally, IRB approval was obtained in this study (AS15173).
Results

In this study, we analyzed a database of abdominal CTs performed by the prescription of emergency physicians, and retrospectively investigated the medical history of the patients confirmed in the database. A total of 2,071 abdominal CTs were performed (2,015 patients) during the research period, including 1,978 CTs performed (1,923 patients) on patients over the age of 15 (Fig. 1). As mentioned above, in some cases CTs were performed 2-4 times for the same patients, which were considered as different cases. The research objects, i.e., 1,978 cases of abdominal CTs, were all confirmed to have associated medical records and final interpretations of the radiology attending physicians. Among them, 1,809 patients complained of abdominal pain and 169 patients did not. Cases with abdominal pain were classified according to whether or not the patients had experienced trauma; 1,644 cases suffered from trauma and 165 cases did not. The group without trauma (46.5%) had approximately an 1.5 times higher discharge rate from ED than the group with trauma (32.7%) (Fig. 1).

The medical records were analyzed together with the abdominal CT database to evaluate the baseline characteristics (Table 1). Among all cases, 986 cases (49.8%) were male and 992 (50.2%) were female. The average age was 47.2 ± 18.0 years. Among the total of 1,978 cases, 1,772 (89.6%) did not have any trauma while 206 cases (10.4%) did. A total of 961 (48.6%) patients were admitted to our hospital, and 141 (7.1%) were referred to other hospitals from our institutions. Overall, 876 (44.3%) of the patients were discharged from our ED.

The incidence of major diagnoses from the final inter-

Fig. 1. Flowchart of patients in the emergency department who underwent abdominal computed tomography.
CT: computed tomography, ED: emergency department
pretation of abdominal CTs were analyzed, and the diagnoses were classified according to the highest frequencies by organ (Table 2). The most frequent organs involved were those in the urinary system (366 cases; 18.5%) followed by the appendix (256 cases; 12.9%), liver (177 cases; 8.9%), large intestine (148 cases; 7.5%), and gallbladder (145 cases; 7.3%). The most frequent diagnoses in these organs were urinary stone (257 cases; 13.0%), appendicitis (227 cases; 11.5%), liver cirrhosis (49 cases; 2.5%), infectious colitis (48 cases; 2.4%) and acute cholecystitis (104 cases; 5.3%). Other common diagnoses were acute pyelonephritis (48 cases; 2.4%) in the urinary system and diverticulitis (44 cases; 2.2%) in large intestine. Furthermore, diagnoses that were rare in CT interpretations but require urgent interventions were also recorded according to the organ involved, except for cancer (Table 3).

At the time when the CTs were performed, the most frequent location of pain was the right lower quadrant (RLQ), with 429 cases (21.7%) followed by right upper quadrant (RUQ), with 293 (14.8%) cases, lower abdomen 227 (11.5%), epigastrium 202 (10.2%), right flank 179 (9.0%), left flank 143 (7.2%) and whole abdomen 122 (6.2%) (Table 4). There were 126 cases (6.3%) without pain, and there was no information related to pain in 43 (2.2%) cases due to decreased mentality or omission of medical records.

The most frequently performed CT type was enhanced abdominal pelvic CT in all locations of pain, except for biliary pancreas CT in the case RUQ pain. The second most frequently performed CTs types depended more or less on the location of abdominal pain: appendix CT for RLQ pain, urography CT for right and left flank pain, and traumatic abdominal CT for lower abdominal pain, whole abdominal pain, and left lower quadrant pain.

With respect to the overall number of CTs performed, enhanced abdominal pelvic CT was the most frequent, with 1,260 cases (63.7%), followed by biliary pancreas CT

Table 1. Baseline characteristics of the patients (≥15 years) in the abdominal CT database

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>N=1,978</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>47.2±18.0</td>
</tr>
<tr>
<td>Gender: male</td>
<td>986 (49.8)</td>
</tr>
<tr>
<td>With abdominal pain</td>
<td>1809 (91.4)</td>
</tr>
<tr>
<td>With trauma</td>
<td>206 (10.4)</td>
</tr>
<tr>
<td>Discharged from the ED</td>
<td>876 (44.3)</td>
</tr>
</tbody>
</table>

Values are presented as mean ± standard deviation or n (%).
CT: computed tomography, ED: emergency department

Table 2. Frequent organs and common diagnoses in CT interpretations

<table>
<thead>
<tr>
<th>Organs</th>
<th>N (%)</th>
<th>Diagnoses</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kidney, ureter, and bladder</td>
<td>366 (18.5)</td>
<td>Ureter and UVJ stone</td>
<td>257 (13.0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acute pyelonephritis</td>
<td>48 (2.4)</td>
</tr>
<tr>
<td>Appendix</td>
<td>256 (12.9)</td>
<td>Acute appendicitis</td>
<td>227 (11.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perforated appendix</td>
<td>19 (1.0)</td>
</tr>
<tr>
<td>Liver</td>
<td>177 (8.9)</td>
<td>Liver cirrhosis</td>
<td>49 (2.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HCC</td>
<td>23 (1.2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hepatitis</td>
<td>23 (1.2)</td>
</tr>
<tr>
<td>Large intestine</td>
<td>148 (7.5)</td>
<td>Infectious colitis</td>
<td>48 (2.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diverticulitis</td>
<td>44 (2.2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IBD</td>
<td>17 (0.9)</td>
</tr>
<tr>
<td>Gallbladder</td>
<td>145 (7.3)</td>
<td>Acute cholecystitis</td>
<td>104 (5.3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gallbladder stone</td>
<td>21 (1.1)</td>
</tr>
<tr>
<td>Uterus, adnexa and pelvic cavity</td>
<td>143 (7.2)</td>
<td>Ovarian cyst rupture</td>
<td>26 (1.3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PID</td>
<td>23 (1.2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adnexal cyst</td>
<td>16 (0.8)</td>
</tr>
<tr>
<td>Small bowel</td>
<td>110 (5.6)</td>
<td>Infectious enteritis</td>
<td>49 (2.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Paralytic ileus</td>
<td>15 (0.8)</td>
</tr>
<tr>
<td>Pancreas</td>
<td>67 (3.4)</td>
<td>Acute pancreatitis</td>
<td>56 (2.8)</td>
</tr>
<tr>
<td>Common bile duct</td>
<td>59 (3.0)</td>
<td>Acute cholangitis</td>
<td>35 (1.8)</td>
</tr>
<tr>
<td>Stomach</td>
<td>32 (1.6)</td>
<td>Acute gastritis</td>
<td>12 (0.6)</td>
</tr>
</tbody>
</table>

CT: computed tomography, UVJ: ureterovesical junction, HCC: hepatocellular carcinoma, IBD: inflammatory bowel disease, PID: pelvic inflammatory disease
267 cases (13.5%), traumatic abdominal CT 176 cases (8.9%), liver dynamic CT 118 cases (6.0%), urography CT 93 cases (4.7%), appendix CT 61 cases (3.0%), and non-enhanced abdominal pelvic CT 3 cases (0.2%) (Table 5).

An average of 5.2 CTs were conducted per day during weekdays (a total of 249 days) with a total of 1,289 CTs, and an average of 5.9 CTs were carried out per day during holidays (a total of 116 days) with a total of 689 CTs. With respect to the number of CTs performed for each time slot within a 24-hour period, there were 620 (31.3%) CTs performed during the ‘day’, 711 (35.9%) during the ‘evening’, and 647 (32.7%) during the ‘night.’

**Table 3. Rare but critical diagnoses in CT interpretations**

<table>
<thead>
<tr>
<th>Organs</th>
<th>Diagnoses</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liver</td>
<td>Liver laceration</td>
<td>11</td>
</tr>
<tr>
<td>Stomach</td>
<td>Gastric perforation</td>
<td>9</td>
</tr>
<tr>
<td>Spleen</td>
<td>Spleen laceration</td>
<td>9</td>
</tr>
<tr>
<td>Small bowel</td>
<td>Small bowel perforation</td>
<td>8</td>
</tr>
<tr>
<td>Uterus, adnexa and pelvic cavity</td>
<td>Tuboovarian abscess</td>
<td>6</td>
</tr>
<tr>
<td>Large intestine</td>
<td>Colon perforation</td>
<td>3</td>
</tr>
<tr>
<td>Kidney, ureter and bladder</td>
<td>Kidney infarction</td>
<td>3</td>
</tr>
<tr>
<td>Spleen</td>
<td>Splenic rupture</td>
<td>1</td>
</tr>
<tr>
<td>Artery</td>
<td>SMA embolism</td>
<td>1</td>
</tr>
<tr>
<td>Duodenum</td>
<td>Duodenal perforation</td>
<td>1</td>
</tr>
</tbody>
</table>

CT: computed tomography, SMA: superior mesenteric artery

**Table 4. Frequent types of abdominal CT according to the location of pain**

<table>
<thead>
<tr>
<th>Location (N=1,978)</th>
<th>Type of abdominal CT</th>
</tr>
</thead>
<tbody>
<tr>
<td>RLQ 429 (21.7)</td>
<td>Enhanced abdominal pelvic CT 371 (18.8)</td>
</tr>
<tr>
<td></td>
<td>Appendix CT 51 (2.6)</td>
</tr>
<tr>
<td>RUQ 293 (14.8)</td>
<td>Biliary pancreas CT 159 (8.0)</td>
</tr>
<tr>
<td></td>
<td>Enhanced abdominal pelvic CT 63 (3.2)</td>
</tr>
<tr>
<td>Lower abdomen 227 (11.5)</td>
<td>Enhanced abdominal pelvic CT 192 (9.7)</td>
</tr>
<tr>
<td></td>
<td>Traumatic abdominal CT 17 (0.9)</td>
</tr>
<tr>
<td>Epigastrium 202 (10.2)</td>
<td>Enhanced abdominal pelvic CT 105 (5.3)</td>
</tr>
<tr>
<td></td>
<td>Biliary pancreas CT 65 (3.3)</td>
</tr>
<tr>
<td>Right flank 179 (9.0)</td>
<td>Enhanced abdominal pelvic CT 127 (6.4)</td>
</tr>
<tr>
<td></td>
<td>Urography CT 36 (1.8)</td>
</tr>
<tr>
<td>Left flank 143 (7.2)</td>
<td>Enhanced abdominal pelvic CT 105 (5.3)</td>
</tr>
<tr>
<td></td>
<td>Urography CT 23 (1.2)</td>
</tr>
<tr>
<td>Whole abdomen 122 (6.2)</td>
<td>Enhanced abdominal pelvic CT 69 (3.5)</td>
</tr>
<tr>
<td></td>
<td>Traumatic abdominal CT 41 (2.1)</td>
</tr>
<tr>
<td>LLQ 72 (3.6)</td>
<td>Enhanced abdominal pelvic CT 61 (3.1)</td>
</tr>
<tr>
<td></td>
<td>Traumatic abdominal CT 6 (0.3)</td>
</tr>
<tr>
<td>No pain 126 (6.4)</td>
<td>Enhanced abdominal pelvic CT 47 (2.4)</td>
</tr>
<tr>
<td></td>
<td>Liver dynamic CT 32 (1.6)</td>
</tr>
</tbody>
</table>

Values are presented as numbers (%).
CT: computed tomography, RLQ: right lower quadrant, RUQ: right upper quadrant, LLQ: left lower quadrant

**Table 5. Incidence of abdominal CT types performed by ED physicians**

<table>
<thead>
<tr>
<th>Type of abdominal CT</th>
<th>N=1,978</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhanced abdominal pelvic CT</td>
<td>1,260 (63.7)</td>
</tr>
<tr>
<td>Biliary pancreas CT</td>
<td>267 (13.5)</td>
</tr>
<tr>
<td>Traumatic abdominal CT</td>
<td>176 (8.9)</td>
</tr>
<tr>
<td>Liver dynamic CT</td>
<td>118 (6.0)</td>
</tr>
<tr>
<td>Urography CT</td>
<td>93 (4.7)</td>
</tr>
<tr>
<td>Appendix CT</td>
<td>61 (3.0)</td>
</tr>
<tr>
<td>Non-enhanced abdominal pelvic CT</td>
<td>3 (0.2)</td>
</tr>
</tbody>
</table>

Values are presented as numbers (%).
CT: computed tomography, ED: emergency department
Abdominal CT is generally considered as the best modality for making a diagnosis in the ED for patients presenting with acute abdominal pain. Ultrasonography and magnetic resonance imaging (MRI), which may be considered as alternatives to CT, have the advantage of no harm from radioactive exposure. However, it is hard to compare the imaging modalities with abdominal CT in terms of clinical application, in that it is more difficult to secure objectivity because of the diversity of the tester’s experience and because the use of MRI has not been verified in terms of cost-effectiveness and might not be available in some institutions\textsuperscript{8).} As ultrasonography does not involve the use of ionized radiation, and therefore tends to be preferred in pregnant women and children to determine the cause of abdominal pain. Other than such cases, abdominal CT can be considered to be the first modality for the prompt and accurate diagnosis of abdominal pain.

Urinary stone (ureter stone and ureterovesical junction stone) is a common cause of acute abdominal pain in patients visiting the ED and is usually accompanied by pain in the left or right flank\textsuperscript{10,11).} In this study, the total number of cases with flank pain (both left and right) at the time of CT performance was 322, including 200 cases with urinary stones. In other words, among the patients over the age of 15 who came to the ED for flank pain and had an abdominal CT following prescription of emergency physicians, 62.1\% (200/322) had a final interpretation of urinary stone. Non-enhanced abdominal pelvic CT is currently considered to be the best imaging modality for diagnosing urinary and kidney stones\textsuperscript{12).} However, ultrasonography can be considered as an alternative owing to the delays caused by the busy schedules of CT technicians and to avoid exposure to radioactivity. Yet, it has been reported that a performance experience of over 30 times is required for an emergency physician to achieve satisfactory interpretation accuracy with ultrasonography\textsuperscript{13).} Indeed, ultrasonography cannot be used as frequently as abdominal CT in the actual ED environment owing to the vast amount of experience required for diagnosis of urinary stones with this method.

In this study, the locations of the pain at the time of CT performance were analyzed. RLQ pain was most frequent followed by RUQ, lower abdomen, epigastrium, right flank, left flank and whole abdomen. RLQ pain is a common symptom of patients visiting the ED, and acute appendicitis is known to be its most frequent cause\textsuperscript{14-17).} In this study, as mentioned above, pain in the RLQ was the most frequent, and the final interpretation showed that 204 of these cases (47.6\%) had acute appendicitis. Therefore, this finding indicates that approximately half of all patients over the age of 15 who visit the ED with RLQ pain and undergo abdominal CTs based on the prescription of emergency physicians can be expected to have acute appendicitis.

Recent studies have shown that low-dose radiation abdominal CT is not inferior to classical abdominal CT with respect to its diagnostic capability for appendicitis, although its resolution seems to be somewhat lower\textsuperscript{18).} Thus, ED of our institution routinely conducts low-dose abdominal CT (appendix CT) only for patients suspected to have appendicitis between the ages of 15 and 44 years, who consent in writing.

The discharge rate from the ED of the group of patients with abdominal pain and no trauma was 1.5 times higher than that of the group of patients with both pain and trauma. This may be because the severity of the group with abdominal pain and trauma was higher than that of the other group, although we did not investigate the difference in the severity of the two groups. If this difference in the discharge rate was independent of the severity of the two groups, concern about delayed hemorrhage or hidden perforation in the trauma patients may have influenced the decision for discharge among the medical team.

The average number of abdominal CTs performed by emergency physicians in the ED was 5.2 times per weekday and 5.9 times per holiday. Although there was no significant difference in the number of CTs between weekdays and holidays, it is assumed that the patients who would have visited the hospital as outpatients on weekdays would have to visit emergency department on holidays. The number of CTs performed according to time slots were 620 during the ‘day’, 711 during the ‘evening’ and 647 during the ‘night’. with no significant differences in the number of CTs performed between time slots.

Based on the results of the present study, we have made a preliminary interpretation checklist (Appendix 1), which we intend to use not only for the education of
emergency residents but also as a systemic approach to interpretations of abdominal CT. In the checklist, significant findings according to each organ are listed. The articles in the checklist were filled out based on the incidence of disease or clinical significance. The checklist also includes the space for describing region of interest and the difference between preliminary interpretations and final interpretations. We are now in the progress of pilot study about learning curve for acute appendicitis using this checklist. Some defects were found in the checklist during pilot study. For example, it involves extremely rare and difficult findings to read through abdominal CT such as prostate abscess. Also, because simple cyst in liver and kidney are mostly insignificant in ED, it can be better to take this finding to ‘Any other description’.

There are some limitations of this study that should be mentioned. First, as this study was conducted at a single institution, it may not comprehensively reflect the various epidemiological characteristics of abdominal pain and related diseases. Second, as the duration of this study was only one year, diseases with a low incidence might have been omitted from the CT database. Lastly, because this study was conducted based on abdominal CT database, there may have been redundant counts when CT was performed more than twice on the same patients within short intervals.

**Conclusion**

Interpretations of abdominal CT results conducted on patients visiting the ED were very diverse, ranging from critical to mild diseases and from common to rare diseases. As it may be difficult to obtain prompt interpretations from radiology attending physicians in the ED, emergency physicians need to have sufficient interpretation capability of abdominal CTs over a certain level. It is essential to be able to accurately visualize and locate all major organs without omission.

**Conflict of Interest**

No potential conflict of interest relevant to this article was reported.

**Acknowledgments**

Jaemin Kim contributed to our work through collecting data for this study.

**REFERENCES**

## Appendix 1. Preliminary interpretation checklist for emergency department (ED) residents

<table>
<thead>
<tr>
<th>Patient review</th>
<th>Identification number (not patient number)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. chief complaint :</td>
<td></td>
</tr>
<tr>
<td>2. region of interest (organ)</td>
<td></td>
</tr>
<tr>
<td>3. physical examination related first impression and the reason of CT performance</td>
<td></td>
</tr>
</tbody>
</table>

### Abdomen CT finding – mark V in □

<table>
<thead>
<tr>
<th>Part of Abdomen</th>
<th>Abnormal Findings</th>
</tr>
</thead>
</table>
| Liver | - parenchyma  
  - mass □ abscess □ peri-parenchyma enhancement  
  - color change □ hepatitis □ fatty liver □ surface □ regular □ irregular  
  - hepatic duct □ dilatation □ stone □ pneumobiliary duct  |
| 9. Uterus and adnexa | - Uterus □ mass □ abscess  
  - Ovary and tube □ abnormal cyst □ mass □ abscess  
  - □ perifluid collection □ infiltration  |
| 10. Etc. |  
  - Peritoneum, Mesentery and Abdominal wall □ mass □ peritoneum thickening  
  - □ mesentery or fat infiltration  
  - □ LN enlargement □ size ( )  
  - □ fluid collection □ air  
  - Prostate □ mass □ enlargement  |
| Adrenal gland | - □ cyst □ mass  |
| Kidney, Ureter and Bladder |  
  - kidney size ( □ normal □ abnormal )  
  - renal □ mass □ stone □ abscess □ wedge multiple patch (APN)  
  - peri wall infiltration □ fluid collection  
  - hydronephrosis □ renal calyces □ renal pelvis  
  - ureter □ mass □ stone □ wall thickening □ enhancement □ hydrourerter  
  - bladder □ mass □ wall thickening □ enhancement  |
| 11. Vessel check up list |  
  - aorta □ IVC □ femoral artery □ femoral vein □ SMA □ IMA  
  - renal artery □ renal vein □ splenic artery □ splenic vein  
  - celiac trunk □ portal vein  
  - □ aneurysm □ thrombus □ dissection  |
| Any other description (not significant findings such as small cyst or other findings which are not described above) | □ □ |

### Conclusion

1. Preliminary interpretations by ED residents

2. Final interpretations of radiology attending physicians

**Significant differences between two interpretations**

1. R1  
2. R2  
3. R3  
4. R4