

# An Audit of the Gynecological Emergencies requiring Emergency Laparotomy in a Tertiary Care Hospital: Timeline of Events from Arrival to Emergency to Arrival to Operation Theater

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## ABSTRACT

**Introduction:** Gynecological emergencies can threaten the life of the female and cause loss of fertility and organ. Ruptured ectopic pregnancy is the most prevalent of the gynecological potentially life-threatening emergencies (G-PLEs). Diagnostic tools are medical history, clinical examination, imaging, and lab investigations, mainly human chorionic gonadotropin ( $\beta$ -HCG) and hemoglobin. Surgery is the mainstay of treatment and the approach can be laparotomy and laparoscopy.

**Objective:** The objective of this study is to assess the time taken from arrival in the emergency department (ED) to arrival to diagnosis and to assess the time taken from arrival to ED to arrival to operation theater (OT) and correlate the time taken with patient morbidity.

**Methods:** The study was done between April 1, 2021 and September 30, 2021. All patients with suspected gynecological emergencies requiring emergency laparotomy/laparoscopy arriving at the ED were included in the study. Data collection was from medical records – six time intervals were collected.

**Results:** There were 16 ruptured ectopic pregnancies during the study period. ED to OB consultation was in <60 min in 12 (75%) cases. ED to ultrasound (USG) and diagnosis were in <60 min in 11 (73%) cases. Diagnosis to OT was in <60 min in only 8 (50%) cases. Delay after diagnosis was due to delay in admission in four (delay in the decision by attendees mostly due to financial constraints), delay in the decision for surgical intervention in three, and nonavailability of blood in one patient. All 5 (100%) patients with grades III and IV of shock had hemoperitoneum >1.5 L and 3 (60%) required postoperative intensive care unit (ICU).

**Conclusion:** Higher morbidity was seen in a higher grade of shock. It is essential to recognize the degree of physiological deterioration with the help of an early warning scoring system. Timely surgical intervention with simultaneous efforts for resuscitation reduces morbidity and mortality.

**Keywords:** Gynecological emergency, Gynecological potentially life-threatening emergencies, Ruptured ectopic pregnancy, Timeline of events.

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## INTRODUCTION

Gynecological emergencies are disease conditions of female reproductive system that threatens the life of the woman, her fertility, and sexual function.<sup>1</sup>

They include early pregnancy complications and nonpregnancy-related gynecological complications. Ruptured ectopic pregnancy, hemoperitoneum of any gynecological origin, adnexal torsion, and complicated pelvic inflammatory disease (PID) (pelvic abscess, tubo-ovarian abscess) are some of the potentially life-threatening gynecological emergencies.<sup>2-4</sup>

Late diagnosis and inappropriate management can lead to mortality, loss of organ, and fertility.<sup>2</sup> The diagnostic tools are medical history, clinical examination, imaging, and laboratory tests.<sup>1,2</sup> Surgery is the mainstay of treatment and the approach can be laparotomy or laparoscopy.<sup>4</sup>

According to the National Confidential Enquiry into Patient Outcome and Death (NCEPOD) classification of surgical intervention, the target time to theater should be within minutes of decision to operate in life-threatening emergencies, where resuscitation is simultaneous with surgical treatment, for example, ruptured ectopic pregnancy.<sup>5-7</sup> Where the condition is a threat to organ survival or deterioration of conditions that threaten life, target time to theater is within hours of decision to operate and is performed

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once resuscitation is completed, for example, peritonitis.<sup>5</sup> There is no recommendation on the appropriate time for surgical intervention in various gynecological emergencies. Also, there are no published studies addressing this issue.

We planned to audit gynecological emergencies requiring emergency laparotomy and assess our current ability against the standard given by the NCEPOD.

The aim of this study was to analyze the time taken from arrival in the ED to arrival at diagnosis and arrival to OT in various

gynecological emergencies requiring surgical interventions (laparotomy/laparoscopy) and correlate the time taken with patient morbidity.

Also, the prevalence of various disease conditions contributing to gynecological emergency requiring surgical intervention (laparotomy/laparoscopy) was estimated.

The study would help to identify the delaying step so that necessary corrective actions can be taken. Early diagnosis and timely intervention are important to reduce morbidity and mortality in these emergencies.

**METHODS**

This is a retrospective cross-sectional study of gynecological emergencies arriving to the ED and requiring emergency surgical intervention (laparotomy/laparoscopy).

The study was done at a teaching hospital located in Bengaluru, India between April 1, 2021 and September 30, 2021. The IEC approval was obtained prior to the initiation of the study (IEC Ref. No 337/2021). The ED has Emergency Medicine Fellowship program and attached ICU.

The residents and consultants of the department of obstetrics and radiology are available on call round the clock. In majority of cases, USG is done by radiologist in USG room; however, in few cases, USG is done in the ED with portable machine by radiologist or emergency physicians.

All the patients coming to the ED with early pregnancy complication and nonpregnancy-related gynecological complication requiring emergency laparotomy or laparoscopy during the study period were included in the study.

Data were collected from the patient’s medical record. Data regarding clinical condition of the patient on arrival like pulse, SBP, DBP, Hb% were noted for each patient. The grade of shock on arrival to ED was analyzed.

The timeline of events was noted. The time intervals measured were as follows:

- ED arrival to obstetric consultation
- ED arrival to laboratory reports
- ED arrival to ultrasound reports or diagnosis
- Diagnosis to OT arrival
- ED arrival to admission
- ED arrival to OT arrival

The demographic details like age and obstetric (OB) index were noted.

The OB consult time was defined by the time taken for the OB consultant to see the patient from the time of arrival in the ED, as documented in the consultant notes. The USG report time was noted from the radiologist notes. Lab reports (hemoglobin, β-HCG, and other reports) were collected by the resident doctors.

The OT arrival was defined by the time documented on arrival to OT by the anesthetist. The patient outcome was defined in terms of morbidity and mortality. Morbidity was measured by the estimated blood loss, need for blood and blood products, and need for ICU.

**Analysis**

Data were analyzed using StataCorp. 2019. Stata Statistical Software: Release 16. College Station, TX: StataCorp LLC. All categorical and continuous measurements were summarized using frequency percentage and mean ± SD or median inter quartile range (IQR) based on the distribution. The association of time taken for

different procedures with clinical outcomes of pregnancy was assessed using Chi-square test. *p*-value was considered significant at 5% level of significance for all comparison.

**RESULTS**

We had 20 gynecological emergencies arriving at the ED during the study period, with ruptured ectopic being maximum of 16 (80%) (Table 1).

Statistical analysis was done for ruptured ectopic cases. The time taken for each stage from arrival in the ED is documented in Table 2.

The time taken by our laboratory to give reports after receiving the sample was 48 minutes (the average time). The median time for arrival in the ED to laboratory reports was 77 minutes. The median time for arrival in the ED to the USG report and diagnosis was 45 minutes, and the median time from diagnosis to OT was 75 minutes.

The percentage of cases where time taken for each stage was <30 minutes, 30–60 minutes, and >60 minutes was analyzed (Table 3).

The ED to OB consultant was <60 minutes in 12 (75%) cases. The ED to USG and diagnosis were in <60 minutes in 11 (73%) cases and the diagnosis to OT was <60 minutes in only 8 (50%) cases. Diagnosis was followed by decision for immediate laparotomy as per the hospital protocol for rupture ectopic in shock.

Delay of >1 hour from diagnosis to OT was due to delay in admission in four, nonavailability of blood in one, and delay in decision for surgical intervention in three patients.

The time from ED to OT was also analyzed. Five (31%) reached OT in <120 minutes. There was delay of >240 minutes in 5 (31%) cases. The cause of delay in these cases was due to delay in the OB consultation by >3 hours in three cases and delay in admission by >3 hours in 2 cases (Table 3).

There were 11 (68.75%) cases with grades I and II of shock and V (31.25%) cases with grades III and IV of shock (Fig. 1).

In four (80%) cases with grades III and IV of shock, the arrival from ED to OT time was <120 minutes. Where the delay was >240 minutes, all were in grade I or II of shock. So, we infer that patients

**Table 1:** Frequency of gynecological emergencies

| Gynecological emergencies    | Frequency | %   |
|------------------------------|-----------|-----|
| Ruptured ectopic             | 16        | 80  |
| Ovarian torsion              | 2         | 10  |
| Pelvic abscess with sepsis   | 1         | 5   |
| Post-TAH with hemoperitoneum | 1         | 5   |
| Total                        | 20        | 100 |

TAH, total abdominal hysterectomy

**Table 2:** Timelines from arrival to ED to arrival to OT

| Variable (min)          | N  | P50  | P25   | P75   | Min. | Max. |
|-------------------------|----|------|-------|-------|------|------|
| ED to OB consultation   | 16 | 25   | 10    | 72.5  | 10   | 255  |
| ED to laboratory report | 16 | 77.5 | 75    | 110   | 55   | 330  |
| ED to USG and diagnosis | 15 | 45   | 30    | 90    | 25   | 285  |
| ED to admission         | 16 | 97   | 71.5  | 186   | 41   | 347  |
| Diagnosis to OT         | 16 | 75   | 37.5  | 180   | 20   | 300  |
| ED to OT                | 16 | 185  | 107.5 | 297.5 | 70   | 430  |

with higher grade of shock received care in shorter time intervals (Table 4).

The mean Hb% on arrival was 9.99 gm%, SD 2.05. There was no mortality in our patients. Morbidity was determined by estimating intraoperative hemoperitoneum and need for postoperative ICU care (Table 5).

**Table 3:** Measured frequencies in each stage

| Variable                 | Frequency | %     |
|--------------------------|-----------|-------|
| ED to OB consultation    |           |       |
| ≤30 min                  | 10        | 62.5  |
| 31–60 min                | 2         | 12.5  |
| >60 min                  | 4         | 25    |
| ED to laboratory reports |           |       |
| 31–60 min                | 1         | 6.25  |
| >60 min                  | 15        | 93.75 |
| ED to USG and diagnosis  |           |       |
| ≤30 min                  | 4         | 26.67 |
| 31–60 min                | 7         | 46.67 |
| >60 min                  | 4         | 26.67 |
| ED to admission          |           |       |
| <60 min                  | 3         | 18.75 |
| 61–120 min               | 7         | 43.75 |
| >120 min                 | 6         | 37.5  |
| Diagnosis to OT          |           |       |
| ≤30 min                  | 3         | 18.75 |
| 31–60 min                | 5         | 31.25 |
| >60 min                  | 8         | 50    |
| ED to OT                 |           |       |
| ≤120 min                 | 5         | 31.25 |
| 121–240 min              | 6         | 37.5  |
| >240 min                 | 5         | 31.25 |

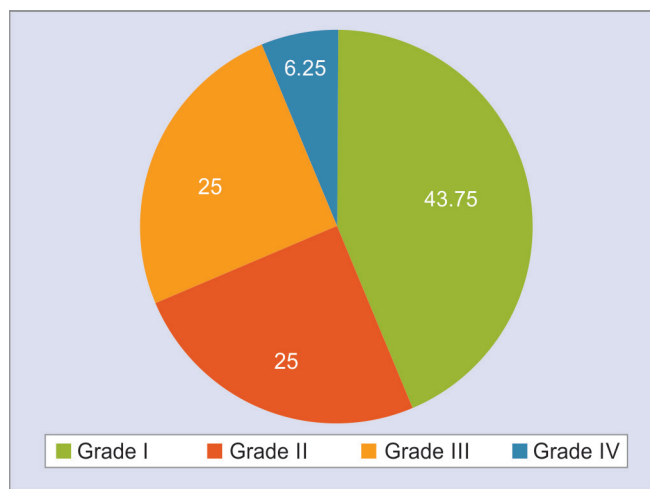
For all patients with grades III and IV of shock, V (100%) had hemoperitoneum of >1.5 L and 3 (60%) required postoperative ICU care.

None in grades I and II of shock required ICU care (Table 5). We hence infer that higher morbidity was seen in higher grade of shock.

There were four other gynecological emergencies (Table 6). Ovarian torsion in two patients with arrival to ED to arrival to OT of <12 hours and <3 hours and underwent laparoscopic cystectomy, laparotomy and cystectomy, respectively. There was one case of septic shock with ED to OT time of 6 hours. There was one case of post-total abdominal hysterectomy (TAH) with hemoperitoneum with grade III of shock where the ED to OT was 6 hours; the cause of delay was due to delay in admission and there was significant morbidity requiring blood transfusions and postoperative ICU care with ventilator support.

### DISCUSSION

This is the first study to look at the time lines for diagnosis and surgical intervention in gynecological emergencies.



**Fig. 1:** Grades of shock

**Table 4:** Correlation of time of arrival in the ED to arrival in the OT with grade of shock

| ED to OT    | Shock grades I and II (%) | Shock grades III and IV (%) | Total      | p-value (Fisher's exact test) |
|-------------|---------------------------|-----------------------------|------------|-------------------------------|
| <120 min    | 1 (9.09%)                 | 4 (80%)                     | 5 (31.25%) | 0.027                         |
| 121–240 min | 5 (45.45%)                | 1 (20%)                     | 6 (37.5%)  |                               |
| >240 min    | 5 (45.45%)                | 0                           | 5 (31.25%) |                               |
| Total       | 11 (100%)                 | 5 (100%)                    | 16 (100%)  |                               |

**Table 5:** Comparison of shock with morbidity

| Variable   | Shock grades I and II (%) | Shock grades III and IV (%) | Total       | p-value (Fisher's exact test) |
|------------|---------------------------|-----------------------------|-------------|-------------------------------|
| Blood loss |                           |                             |             |                               |
| ≤1.5 L     | 8 (72.73%)                | 0                           | 8 (50%)     | 0.026                         |
| >1.5 L     | 3 (27.27%)                | 5 (100%)                    | 8 (50%)     |                               |
| ICU        |                           |                             |             |                               |
| No         | 11 (100%)                 | 2 (40%)                     | 13 (81.25%) | 0.018                         |
| Yes        | 0                         | 3 (60%)                     | 3 (18.75%)  |                               |
| Total      | 11 (100%)                 | 5 (100%)                    | 16 (100%)   |                               |

**Table 6:** Timeline of events and morbidity in other gynecological emergencies

| Patient diagnosis       | ED to OB consultation | ED to laboratory reports | ED to USG diagnosis | ED to admission | Diagnosis to OT | ED to OT | Grade of shock | Hemoperitoneum | ICU |
|-------------------------|-----------------------|--------------------------|---------------------|-----------------|-----------------|----------|----------------|----------------|-----|
| Patient 1               |                       |                          |                     |                 |                 |          |                |                |     |
| Ovarian torsion         | 55                    | 185                      | 85                  | 172             | 660             | 760      | –              | 250            | No  |
| Patient 2               |                       |                          |                     |                 |                 |          |                |                |     |
| Ovarian torsion         | 10                    | 129                      | 30                  | 48              | 180             | 220      | –              | 200            | No  |
| Patient 3               |                       |                          |                     |                 |                 |          |                |                |     |
| Sepsis                  | 10                    | 240                      | 60                  | 90              | 240             | 360      | 4              | 100            | Yes |
| Patient 4               |                       |                          |                     |                 |                 |          |                |                |     |
| TAH with hemoperitoneum | 15                    | 105                      | 30                  | 220             | 270             | 375      | 3              | 2500           | Yes |

TAH, total abdominal hysterectomy

Maximum cases were of rupture ectopic pregnancy in our study. This was similar to the study by Fauconnier et al. and Hammond.<sup>4,8</sup> The time taken from arrival to ED to OB consultation was within 30 minutes in 62% with a median of 25 minutes.

Urquhart et al. reported arrival to consult time of median of 16 minutes in the point of contact USG done in ED (POCUS) group and 127 minutes in Radiology Department performed USG (RADUS) group.<sup>9</sup>

Ghandehari et al. in their study of time lines in ovarian torsion reported the ED to physician assessment time of median is 1.3 hours.<sup>10</sup>

Extreme delay in OB consult in our study was due to misdiagnosis and failure to suspect gynecological cause by the ED physician on arrival in the ED due to varied presentation of the gynecological emergencies mimicking other surgical and medical emergencies. Diagnostic errors for G-PLE conditions are major errors that are likely to lead to delay in treatment.<sup>4</sup>

The USG (TVS) was found to be the diagnostic tool with the highest performance for the diagnosis of G-PLES.<sup>2</sup>

Diagnosis is based on multiple diagnostic tools and is a process of progressive nature. Exact moment of diagnosis is difficult to determine.<sup>4</sup> We considered time of the USG as the time of arrival at diagnosis in our study.

Our median time for the USG and diagnosis was 45 minutes. Urquhart et al. reported mean time of 15 and 138 minutes for their POCUS and RADUS group, respectively.<sup>9</sup>

The median time for arrival in the ED to arrival to OT in our study was 185 minutes with interquartile range of 107–297 minutes. Urquhart et al. reported a median time of 122 minutes in the POCUS group and 362 minutes in the RADUS group.<sup>9</sup>

Fauconnier et al. in their study had a median of 4.25 hours intra-hospital time to treatment for gynecological emergencies with an interquartile range of 8 hours.<sup>4</sup>

The cause for delay in arrival to ED to arrival to OT was the delay in admission due to financial constraints, delay in decision for surgical intervention, and delay in the OB consultation.

Adamu et al. found a delay of >6 hours for emergency abdominal surgeries due to financial constraints in 54%.<sup>11</sup>

Severe morbidity in G-PLE is associated with quality of care.<sup>12</sup> Substandard care due to misdiagnosis of ectopic pregnancy, diagnostic, and therapeutic delay increases severe morbidity due to increased blood loss.<sup>13</sup>

It is crucial to recognize the severity of illness and initiate necessary resuscitative measures to improve the vitals of the patient

simultaneous to efforts to arrive at the diagnosis in emergency situation.<sup>14</sup>

In our study those with higher grade of shock received care without undue delay; in spite of it, higher morbidity was observed in this group. We speculate that delayed treatment in this group could have led to mortality.

The strength of this study was that we could contribute to the limited data available in G-PLEs with respect to timelines at various stages from the patient arrival to treatment. Time series data and the correlation with results help to provide health-care team important feedback to improve quality of care.<sup>15</sup> We believe that such a study will help in identifying the delaying step which, will help to take corrective action.

The limitation of this study is its retrospective design. Therefore, causes that are responsible for delay could not be assessed accurately. The number of nonectopic G-PLEs was few and could not be subjected to statistical analysis.

We can improve outcomes and reduce morbidity by delivering the treatment within a time frame appropriate for the emergency. More research is required in the area of G-PLEs as there are no recommendation and standard set for quality measures by the gynecologic advisory bodies as compared with obstetric emergencies.

## CONCLUSION

Training of ED physicians to recognize gynecological emergencies, point of care USG in ED, standardized treatment protocol, and recognizing the severity of illness with early warning score to determine and recognize physiological deterioration help to save lives and reduce morbidity by preventing delay in intervention.

Also, the patient and relatives cooperation is required to provide timely care. Models for educating patient and attenders about the emergency condition and appropriate counseling will be useful for effective communication. Hospitals should have protocols to provide services to critically sick patients with financial constraints and prevent delay due to reasons of nonaffordability.

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