Research Article

Gynecology & Reproductive Health

Most Common Signs of Emergency Diseases in Women's Health: An Analysis of Virtual Triage Data

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ABSTRACT

Objective: To identify the most common signs, symptoms, and symptom combinations associated with gynecological conditions leading to an emergency care recommendation by the Symptomate virtual triage (VT) application. The study aimed to enhance understanding of how patients present with gynecological emergencies and evaluate VT's potential in supporting timely care-seeking.

Methods: A retrospective analysis was conducted on anonymized data from 39,110 female Symptomate users who completed VT interviews between January 1st and December 31st, 2024, and received an emergency care recommendation with gynecological conditions among the potential diagnoses. Analyzed data points included common differential diagnoses, initial chief complaints, overall present symptoms, and common symptom tuples.

Results: Ovarian torsion (37.06%) and complicated ovarian cyst (30.07%) were the most frequent potential diagnoses. Abdominal pain was the most common initial symptom (27.50%), followed by nausea (24.89%). Overall, abdominal pain was present in 83.45% of interviews, with fatigue (56.79%) and moderate abdominal pain (53.62%) also highly prevalent. The most common symptom tuple was "Abdominal pain, sharp and stabbing & Abdominal tenderness" (13.11% of interviews with tuples). On average, users reported 5.6 initial symptoms and 23 present symptoms/risk factors.

Conclusion: Symptomate VT data reveals that abdominal pain (in various forms), nausea, and fatigue are prominent in users recommended for emergency gynecological care. Specific symptom combinations, particularly pain with tenderness, are frequently identified. These findings can inform clinical triage and highlight VT's potential role in early symptom assessment and guiding appropriate care navigation for gynecological emergencies.

Keywords

Virtual triage, Symptom checker, Women's health, Telemedicine, Gynecological emergency, Digital triage.

Introduction

Virtual Triage (VT) tools, often referred to as "symptom checkers," are increasingly utilized by the public to gain insights into their health conditions and navigate healthcare systems. These Artificial Intelligence (AI)-driven applications offer preliminary symptom assessment and guidance on the appropriate level of care acuity needed, ranging from self-care to emergency services. This contrasts with generic internet searches, which often provide non-personalized and potentially misleading information [1]. VT engines like Symptomate leverage AI, machine learning, and natural language processing, combined with extensive medical knowledge bases, to simulate a clinical interview and provide evidence-based recommendations [2].

A significant challenge in emergency care is the delay in seeking treatment, often stemming from patients underestimating the severity of their symptoms. This "decoupling" between patient perception and actual clinical risk can lead to poorer outcomes and increased healthcare costs. VT holds potential for improving early detection and care acuity alignment by identifying individuals needing urgent care who might otherwise delay seeking help. Understanding the common presenting symptoms and symptom combinations in patients ultimately requiring emergency gynecological care can further enhance the utility of these tools and aid clinicians in recognizing high-risk presentations.

This study aims to identify the most common signs and symptoms associated with emergency gynecological diseases as captured by a public VT application. By analyzing real-world data on patientreported symptoms and VT recommendations, this research seeks to:

- Enhance our understanding of how patients present with gynecological emergencies.
- Identify key symptom patterns that may aid in early recognition and triage.
- Evaluate the potential of VT to support timely and appropriate care-seeking.

The findings of this study have the potential to inform clinical practice, improve the design of VT tools, and ultimately contribute to better outcomes for patients experiencing gynecological emergencies.

Methods

Study Design

This study employed a retrospective analysis of anonymized user data obtained from the Symptomate VT application. The data specifically analyzed for this paper consisted of pre-compiled datasets representing female users whose VT interview resulted in a recommendation for emergency services due to suspected gynecological conditions or symptoms.

Data Source: Symptomate Virtual Triage Application

The data was sourced from Symptomate, an AI-driven VT engine developed by Infermedica. Symptomate is publicly available in multiple languages via web browser and mobile applications (iOS, Android). It utilizes AI, machine learning, and natural language processing techniques, guided by a comprehensive medical knowledge base covering over 900 conditions, 1,800 symptoms, and 340 risk factors, to conduct an interactive interview. The engine dynamically selects questions based on user responses to assess symptom probability and recommends an appropriate level of care acuity (self-care, physician consultation, or emergency care) [2]. Symptomate is classified as a Class I medical device in Europe under the Medical Device Directive (93/42/EEC); the US FDA currently exercises enforcement discretion for such tools.

Participant Selection and Data

The analysis focused on a cohort of 39 110 users satisfying the following inclusion criteria:

- Performed VT interview between Jan 1st and December 31st, 2024.
- Reported female sex
- Concluded the interview and received a recommendation for emergency care (To go hospital or to call an ambulance)

The list of most probable reasons for the patient's symptoms included gynecological conditions

This dataset is distinct from those analyzed in the previous Infermedica publications describing Symptomate users.

Participant Demographics

The cohort of female users included in this analysis, who were recommended for emergency services due to suspected gynecological conditions, exhibited the following age distribution.

Table	1:	Age	distri	bution
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Age label	Count	Percetage
<1 year old	3	0.01%
1-3 years old	13	0.03%
4-11 years old	124	0.32%
12-17 years	3360	8.59%
18-29 years	24994	63.91%
30-44 years	8752	22.38%
45-59 years	1704	4.36%
60-74 years	124	0.32%
75 years and older	36	0.09%

All participants were female, as per the study's focus on gynecological conditions.

Data Points Analyzed

The analysis examined the following data points:

- 1. Most Common Diagnoses: Frequency and percentage of the most common potential differential diagnoses suggested by the VT engine for this emergency referral cohort.
- 2. Most Common Initial Evidences: Frequency and percentage of the initial symptoms (chief complaints) reported by users at the start of the VT interview.
- **3.** Most Common Present Evidences: Frequency and percentage of all symptoms and risk factors, identified as present throughout the completed VT interview for each user.
- 4. Most Common Symptom Tuples: Frequency and percentage of the most common pairs (diads) or triplets (triads) of co-occurring symptoms identified within individual patient interviews.

Ethical Considerations

All data utilized was anonymized at the source, with no personal identifiers collected beyond basic demographics like age and sex provided voluntarily by the user. Users of Symptomate consent to the use of their anonymized data in aggregate for research and analysis purposes upon using the application.

Results

The analysis of the provided datasets revealed distinct patterns in diagnoses, initial symptoms, overall symptom presentation, and symptom combinations among female gynecological patients recommended for emergency care by the Symptomate VT.

Most Common Diagnoses

The most frequent potential diagnoses identified by Symptomate leading to an emergency referral in this cohort included conditions requiring urgent intervention. Ovarian torsion was the most common, followed by a complicated ovarian cyst. Other frequent diagnoses included issues related to pregnancy (third trimester concerns, ectopic pregnancy, threatened miscarriage), pelvic inflammatory disease, and acute endometritis.

Table	2:	Most	common	differential	diagnoses,	matching	symptoms
provid	ed ł	by the u	user.				

Namo	Number of	% of
Ivaine	Interviews	Interviews
Ovarian torsion	14493	37.06%
Complicated ovarian cyst	11762	30.07%
Third trimester pregnancy	7130	18.23%
Ectopic pregnancy	4389	11.22%
Pelvic inflammatory disease	4361	11.15%
Primary dysmenorrhoea	4310	11.02%
First trimester pregnancy	4209	10.76%
Premenstrual syndrome	3813	9.75%
Painful ovulation	3452	8.83%
Threatened miscarriage	2770	7.08%
Acute endometritis	2595	6.64%
Endometriosis	2446	6.25%
Second trimester pregnancy	1983	5.07%
Uterine fibroids	1578	4.03%

Table 3: Most common initial evidence reported by patients as the reason for the interview (chief complaint).

Name	Number of interviews	% of interviews
Abdominal pain	10756	27.50%
Nausea	9734	24.89%
Fatigue	7668	19.61%
Headache	7093	18.14%
Abdominal pain, below navel	6674	17.06%
Bloating	6104	15.61%
Dizziness	5326	13.62%
Abdominal pain, sharp and stabbing	4518	11.55%
Back pain, lumbar	4166	10.65%
Abdominal pain, crampy	3849	9.84%
Back pain	3773	9.65%
Abdominal tenderness	3446	8.81%
Dyspnea	3216	8.22%
Constipation	2911	7.44%
Abdominal pain, right lower quadrant	2775	7.10%
Abdominal pain, colicky	2458	6.28%
Chest pain	2378	6.08%
Diarrhea	2371	6.06%
Abdominal pain, left lower quadrant	2308	5.90%

In total, there were 78,511 results with possible gynecological conditions listed, meaning that, on average, there were over 2 gynecological conditions per emergency interview. Worth noting that in many cases, the possible disease is not an emergency one

itself. In such cases, the reason for the emergency recommendation probably resulted from reported symptoms, not from a possible diagnosis.

Most Common Initial Evidences (Chief Complaints)

Abdominal pain was the most commonly reported initial symptom, cited in 27.50% of interviews. Nausea (24.89%), fatigue (19.61%), and headache (18.14%) were also frequent initial complaints. Notably, specific types of abdominal pain, such as "below navel" (17.06%), "sharp and stabbing" (11.55%), and "crampy" (9.84%), were prominent among the initial symptoms reported.

The total number of reported initial complaints (sum of "Number of interviews" for each initial symptom), was 219,608. This means emergency patients, on average, reported 5.6 initial symptoms per interview.

Most Common Present Evidence

When considering all symptoms present during the interview, abdominal pain was overwhelmingly the most common, identified in 83.45% of cases. Fatigue was the second most frequently reported symptom, present in 56.79% of interviews. Specific characteristics of abdominal pain were also highly prevalent: "Abdominal pain, moderate" was noted in 53.62% of users, and nausea was reported by 50.99%. Other common features included "Abdominal pain, lasting less than 2 days" (42.30%), "Abdominal pain, below navel" (41.10%), and general abdominal tenderness (40.73%). Localized abdominal pain was also a significant finding, with "Abdominal pain, right lower quadrant" in 26.16% of the interviews.

Namo	Tuno	Number of	% of
Ivallie	Type	interviews	interviews
Abdominal pain	symptom	32638	83.45%
Fatigue	symptom	22210	56.79%
Abdominal pain, moderate	symptom	20972	53.62%
Nausea	symptom	19942	50.99%
Abdominal pain, lasting less than 2 days	symptom	16544	42.30%
Residence or recent travel, Europe	risk factor	16334	41.76%
Abdominal pain, below navel	symptom	16074	41.10%
No childbirth in the past 6 weeks	risk factor	15985	40.87%
Abdominal tenderness	symptom	15931	40.73%
Abdominal pain, localized	symptom	14793	37.82%
Bloating	symptom	12998	33.23%
Headache	symptom	12039	30.78%
Consent to a sexual interview	symptom	11971	30.61%
Personal or family history of allergy	risk factor	11333	28.98%
Abdominal pain, right lower quadrant	symptom	11209	28.66%
Diminished appetite	symptom	10999	28.12%
Heel drop test	symptom	10983	28.08%
Back pain	symptom	10699	27.36%
Sexual activity	symptom	10490	26.82%
Overweight and obesity	risk factor	10298	26.33%

Table 4: Most common symptoms and risk factors confirmed by gynecological patients in the course of the interview.

Abdominal pain, left lower quadrant	symptom	10233	26.16%
Abdominal pain, lasting 2 to 7 days	symptom	9665	24.71%
Dizziness	symptom	8582	21.94%
Abdominal pain, sharp and stabbing	symptom	7610	19.46%
Back pain, acute	symptom	7327	18.73%
Headache, moderate	symptom	6850	17.51%
Abdominal pain, mild	symptom	6736	17.22%
Dyspnea	symptom	6617	16.92%
Increased abdominal girth	symptom	6489	16.59%

The total number of all recognised present pieces of evidence, both symptoms and risk factors, was 899,191. On average, an emergency patient confirmed about 23 symptoms or risk factors throughout an interview. Worth noting that in some cases, some of the reported symptoms could be related to each other (e.g., a patient with Moderate abdominal pain always had also Abdominal pain).

 Table 5: Most common tuples- sets of 2 or 3 symptoms -present at the same time.

Name	Number of interviews	% of interviews with tuples
Abdominal pain, sharp and stabbing & Abdominal tenderness	5126	13.11%
Abdominal pain, severe & Abdominal tenderness	2674	6.84%
Abdominal pain & Abnormal vaginal discharge	1955	5.00%
Abdominal pain, severe & Abdominal pain, sharp and stabbing	1434	3.67%
Consciousness disturbances, acute & Dizziness	1208	3.09%
Diarrhea & Dizziness	984	2.52%
Abdominal pain, right lower quadrant & Abdominal tenderness, right lower quadrant	954	2.44%
Pregnancy & Abdominal pain, below belly button & Abdominal pain, moderate	929	2.38%
Inability to pass flatus & Increased abdominal girth & Abdominal tenderness	784	2.00%
Chest pain, pressure & Chest pain, severe	782	2.00%
Abdominal pain, severe & Back pain, severe & Back pain, sudden	558	1.43%
Dizziness & Headache, severe	558	1.43%
Abdominal pain & Abdominal pain, lasting less than 2 days & Abdominal pain, right lower quadrant	547	1.40%
Dyspnea & Chest pain, radiating to the neck	535	1.37%
Dizziness & Paresthesia, sudden onset	526	1.34%

Most Common Symptom Tuples

In some cases, recognizing a possible serious disease is easier by recognizing symptoms coexistence or a pattern we call a tuple. In our study, any tuple has been recognised in 57% of interviews. An analysis of symptom combinations revealed that some patterns occurred far more frequently than others. The most common tuple

was the co-occurrence of "Abdominal pain, sharp and stabbing" and "Abdominal tenderness," found in 13.11% of interviews where tuples were recorded. The combination of "Abdominal pain, severe" and "Abdominal tenderness" was the second most common (6.84%). Other notable tuples involved severe abdominal pain combined with sharp/stabbing pain (3.67%), and specific abdominal pain locations combined with tenderness (e.g., RLQ pain with RLQ tenderness,2.44%). Combinations involving abdominal pain and abnormal vaginal discharge (5%) were also frequent.

Discussion

This study analyzed data from the Symptomate virtual triage application to characterize the symptom profiles of female users recommended for emergency care due to suspected gynecological conditions. The findings highlight the predominance of abdominal pain, nausea, and fatigue in this cohort, alongside specific symptom combinations involving pain and tenderness. Comparing these results with existing medical literature, which primarily draws from emergency department (ED) presentations, provides context and reveals interesting observations regarding symptom reporting via virtual triage.

The literature consistently identifies acute, often severe, unilateral abdominal or pelvic pain as a hallmark of gynecological emergencies [3]. For ovarian torsion, studies report pelvic/abdominal pain in 90-95% of cases presenting to the ED [4]. Nausea and vomiting are also very common, with reported frequencies ranging from 47% to 90% [5]. Abdominal tenderness is noted in around 88% of cases [6], while fever is less common (2-20%) [5]. Our Symptomate data aligns with the centrality of abdominal pain, with various types (sharp/stabbing, severe, RLQ, LLQ) being the most frequent initial complaints and overall present symptoms. Nausea was also common in the Symptomate cohort (initially ~25%, overall \sim 51%), though perhaps reported less frequently initially than the higher end (90%) seen in some ED series for torsion. The high frequency of abdominal tenderness found in the Symptomate data (overall 39.5%, with specific locations like RLQ tenderness also common) also resonates with the literature findings.

For ectopic pregnancy, the classic triad of amenorrhea, abdominal pain, and vaginal bleeding is present in only about 50% of cases presenting clinically [7]. However, individual symptom prevalence is high: abdominal pain is reported in 81% to over 98% of cases [8,9], amenorrhea in 74% to 88% [9,8], and vaginal bleeding in 56% to 69% [7,9]. Abdominal tenderness is also frequent (around 75-78%) [7,9]. The Symptomate data showed ectopic pregnancy as a frequent potential diagnosis leading to emergency referral. The high rates of abdominal pain reported by Symptomate users (initially 27.5% for general abdominal pain, plus specific types) are consistent with the literature. Amenorrhea ("Menstrual period late") and specific vaginal bleeding symptoms ("Abnormal uterine bleeding, nonmenstrual", "Abnormal uterine spotting, nonmenstrual") were reported by Symptomate users but were less prominent as initial complaints compared to abdominal pain and

nausea. This might suggest users initially focus on pain/nausea when using VT, or it could reflect variation in symptom onset or perception in the VT user population compared to ED cohorts.

Pelvic inflammatory disease (PID) presentations in the ED can vary. While lower abdominal pain is the most common symptom, its prevalence isn't always quantified as distinctly as in torsion or ectopic pregnancy due to the often clinical and sometimes subtle nature of the diagnosis. Abnormal vaginal discharge is reported in approximately 75% of clinical PID cases [10], and abnormal bleeding (postcoital or intermenstrual) in about 40% [10]. Fever (>38°C/100.4°F) is found in only about 30% of cases [10]. Adnexal or cervical motion tenderness is key diagnostic sign [11]. The Symptomate data identified PID among the top potential emergency diagnoses and showed high rates of abdominal pain (various types) and tenderness, consistent with the core clinical picture. Abnormal vaginal discharge was reported but less frequently than pain initially, and fever was not a top reported symptom, aligning with literature suggesting fever is present in a minority of cases.

A notable finding is the high prevalence of fatigue reported by Symptomate users (initially 19.6%, overall 54.8%). While fatigue can accompany any significant illness, it's less emphasized in literature focusing on the acute, distinguishing features of gynecological emergencies compared to pain, bleeding, or specific tenderness. Its high rate in VT users might arise from the platform's comprehensive symptom questioning, capturing non-specific symptoms alongside acute ones. It could also reflect characteristics of the user base – perhaps individuals experiencing malaise or uncertainty prompting online assessment, or those accessing VT relatively early in their symptom course before more classic signs fully develop.

The analysis of symptom tuples revealed frequent co-occurrence of "Abdominal pain, sharp and stabbing" with "Abdominal tenderness" (13.11%) and "Abdominal pain, severe" with "Abdominal tenderness" (6.84%). These combinations strongly suggest peritoneal irritation or significant visceral pain with associated guarding/tenderness, aligning with clinical expectations for ruptured structures (ectopic, cyst) or significant inflammation/ ischemia (torsion, severe PID). The ability of the VT tool to identify these high-risk tuples seems to be significant for the overall ability to accurately recognize high acuity cases in remote interviews.

The context of VT use, often driven by uncertainty, is key. VT platforms might engage users who underestimate their symptoms or are earlier in the disease process than typical ED presentations [1]. This could influence the reported symptom frequencies, potentially showing higher rates of early or non-specific symptoms like fatigue alongside developing acute ones. While studies on symptom checker accuracy show variability [12], AI-based tools like Symptomate are continuously evolving. Their potential lies in standardizing preliminary assessment and guiding users, especially those uncertain or prone to delay, towards appropriate care.

Limitations remain, including the reliance on self-reported symptoms and the probabilistic nature of VT diagnoses versus confirmed clinical findings. Direct comparison of prevalence rates requires caution due to differing populations and methodologies. However, the convergence between Symptomate data and literature on core symptoms like abdominal pain and tenderness, and the identification of clinically relevant symptom tuples, supports VT's potential role. The high frequency of fatigue warrants further study. Ultimately, prospective research correlating VT assessments with clinical diagnoses and patient outcomes is crucial to fully define the value and optimal integration of these tools in managing gynecological emergencies.

Conclusions

This analysis of data from the Symptomate VT application provides valuable insights into the common presentations of gynecological conditions requiring emergency care referral. The results consistently highlight the prominence of abdominal pain (often moderate, below the navel, sharp/stabbing, or localized to lower quadrants), nausea, and fatigue as key symptoms in this patient cohort. Specific symptom combinations, particularly involving types of abdominal pain co-occurring with abdominal tenderness, are frequently observed.

Implications for Clinical Practice and Health Policy

Understanding these common symptom patterns can assist clinicians, especially those involved in triage (in-person or remote), in recognizing potential gynecological emergencies more effectively. The high frequency of nonspecific symptoms like fatigue and nausea alongside various types of abdominal pain underscores the complexity of diagnosing these conditions based on initial presentation alone. Knowledge of common symptom tuples may aid in targeted questioning and risk stratification.

Furthermore, this study reinforces the potential value of VT tools like Symptomate in the healthcare ecosystem. Such tools can serve as an accessible first point of contact for individuals experiencing symptoms, helping to guide them toward the appropriate level of care. As demonstrated in related research, a significant proportion of users requiring emergency care initially underestimate their symptom severity or are unsure of the necessary care pathway [1]. VT can potentially bridge this gap by providing evidencebased acuity assessment and recommendations, possibly reducing harmful delays in care. Integrating validated VT tools within health systems could streamline patient navigation and improve resource allocation.

Limitations

Several limitations should be considered. Firstly, the data originates from a VT tool; diagnoses are probabilistic suggestions based on user input and not confirmed clinical diagnoses. Secondly, users of the application are self-selecting and may not represent the general population experiencing gynecological emergencies. Thirdly, the accuracy of the data depends on the user's ability to accurately perceive and report their symptoms. Finally, this analysis uses a specific dataset provided for this study and does not track actual patient actions or clinical outcomes following the VT recommendation. Further research is necessary to validate the clinical impact of VT recommendations on patient behavior, care pathways, and ultimate health outcomes, particularly regarding the alignment of VT-recommended emergency care with confirmed clinical need.

In conclusion, analysis of Symptomate VT data reveals common symptom patterns associated with emergency gynecological referrals, dominated by various presentations of abdominal pain, nausea, and fatigue. These findings can inform clinical triage practices, while highlighting the potential role of AI-driven VT in early symptom assessment and appropriate care navigation.

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