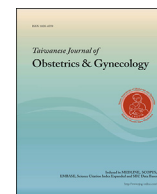




Contents lists available at ScienceDirect

Taiwanese Journal of Obstetrics & Gynecology

journal homepage: www.tjog-online.com

Original Article

Impact of gynecologic hospitalist on patient waiting time at the emergency department in Korea: A retrospective pre-post cohort study

Ga Won Yim^a, Soo Jin Park^b, Eun Ji Lee^b, Maria Lee^b, Hyun Hoon Chung^b, Jae-Weon Kim^b, Hee Seung Kim^{b,*}^a Department of Obstetrics and Gynecology, Dongguk University College of Medicine, Goyang, 10326, Republic of Korea^b Department of Obstetrics and Gynecology, Seoul National University College of Medicine, Seoul, 03080, Republic of Korea

ARTICLE INFO

Article history:
Accepted 15 April 2021

Keywords:
Emergency medicine
Gynecology
Hospitalists
Hospital medicine
Patient care

ABSTRACT

Objective: This study aimed to identify the impact of care and change in the consultation process given by a gynecologic hospitalist on patient waiting time in the emergency department (ED).

Materials and methods: This is a pre-post study that compared patients' length of stay at the ED ten months before and after intervention by the gynecologic hospitalist in 2018. The consultation process changed from ED staff contacting the gynecologic resident (pre-intervention group) to directly contacting the gynecologic hospitalist (post-intervention group). Times elapsed from gynecologic consultation to final disposition, from gynecologic consultation to discharge, and from arrival at ED to discharge were compared between the two groups.

Results: Among 945 referrals at the ED during the study period, the number of daytime weekday gynecologic consultations were 68 and 187 cases in the pre-intervention and post-intervention groups, respectively. The time elapsed from gynecologic consultation to the final disposition, the time elapsed from gynecologic consultation to discharge and the time elapsed from arrival at ED to discharge were shorter in the post-intervention group than in the pre-intervention group (median values, 98 vs. 167.5 min, 205 vs. 311.5 min, and 419 vs. 497 min; $P < 0.05$), and extended length of stay more than 12 h at the ED was less common in the post-intervention group than in the pre-intervention group (9.6 vs. 19.1%; $P < 0.01$).

Conclusion: The waiting time of gynecologic patients upon admission and prolonged length of stay at ED significantly decreased after the establishment of the gynecologic hospitalist system.

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Introduction

In September 2016, a pilot project was initiated by the Ministry of Health and Welfare for implementing the hospital medicine in Republic of Korea [1]. The reason for commencing the hospitalist system was to improve the quality of patient care and to relieve physicians' excessive workloads. Its necessity has been actively discussed, and the major triggering factor for the implementation of the system was due to the changes in residents' working hours according to the 'Act for the improvement

of training conditions and status of medical residents,' enforced in December 2017 [2]. Thereafter, the need to narrow the gap between the working hour limit of residents and efficient inpatient care became imminent.

As of August 2019, there are 30 medical institutions taking part in the government's pilot project, and a total of 142 hospitalists are working nationwide. Among them, more than 60% percent of the hospitalists work for internal medicine, whereas the others do for general surgery, emergency medicine, neurosurgery, pediatrics and gynecology.² In particular, gynecologic hospitalist system was implemented since May 2018 at Seoul National University Hospital (SNUH) for the first time in Republic of Korea. Among several practice models of the hospitalist systems, the SNUH model is unique in that gynecologic emergency service is provided by the hospitalist. This intervention has brought changes in patients'

* Corresponding author. Department of Obstetrics and Gynecology, Seoul National University College of Medicine, 101 Daehak-Ro Jongno-Gu, Seoul, 03080, Republic of Korea. Fax: +82 2 762 3599.

E-mail address: bboddi0311@gmail.com (H.S. Kim).

consultation process and duration of stay at the emergency department (ED), thus enhancing patient safety.

Prolonged waiting times and patient overcrowding at the ED are associated with increased mortality and decreased patient satisfaction [3]. Although reducing the waiting time is challenging, several studies show the positive impact of hospitalist intervention in improving bed management, patient satisfaction, and quality of care in the United States where the hospitalist system had been implemented since more than 20 years ago [3–6]. The hospitalist system is quite new in the Asian region with the first pioneer trial in Taiwan in 2009 [7]. Different hospitalist models are being implemented among institutions with only a few in the emergency field [8–10]. Thus, this study showed the initial experience of a gynecologic hospitalist for emergency care and the impact of gynecologic hospitalist on reducing patient staying time at the ED.

Materials and Methods

Gynecologic hospitalist system

We performed this study at Seoul National University Hospital (SNUH), which is a 1778-bed tertiary teaching hospital in Republic of Korea. Over 22,000 patients are consulted for emergency service at the ED annually. Before the introduction of the gynecologic hospitalist system at this hospital in May 2018, the on-duty gynecologic residents provided acute medical care at the ED, whereas one gynecologic hospitalist (GWY) had been employed for the designated service since then. Specifically, the gynecologic hospitalist worked from 9 AM to 6 PM during the weekdays and patient handoffs were given to the on-duty residents during the night time and weekends. The hospitalist was a board-certified gynecologist with subspecialty in gynecologic oncology.

Data collection

We retrospectively reviewed the medical records of 945 patients consulted to the department of obstetrics and gynecology at the ED between June 2017 and March 2019. Time taken for triage, consultations, admission and discharge are routinely recorded through the electronic medical record system and monitored by the designated staff at the emergency department. We included patients with the following criteria: gynecologic diseases; a single consultation to either the gynecologic hospitalist or residents during the working hours (9AM–6 PM) of weekdays. Among all patients, we excluded 690 patients that did not meet these inclusion criteria because of the visit at the ED during night time and weekends ($n = 542$), multiple consultations to both the gynecologic hospitalist and residents ($n = 33$), and pregnancy-related conditions ($n = 115$). Finally, a total of 255 patients were analyzed, who were divided into the pre-intervention group ($n = 68$) where the gynecologic residents were subjected to consultation before May 2018, and the post-intervention group ($n = 187$) where consultations were given to the gynecologic hospitalist at the ED after that (Fig. 1).

Moreover, the emergency gynecologic consultation process was different between the two groups (Fig. 2). Briefly, upon the initial triage and assessment by the ED physicians, the patients were consulted to the gynecologic department when needed. In the pre-intervention group, the gynecologic residents received the call from the ED physicians and assessed the patient. After appropriate diagnostic tests, the patient would be notified to the clinical fellow followed by the faculty professor with subspecialty according to the patient's condition. On the other hand, the patient was consulted directly to the gynecologic hospitalist and then notified to the faculty of each subspecialty when needed in the post-intervention

group. We performed this grouping roughly ten months before and after the implementation of the gynecologic hospitalist system.

For comparing clinical outcomes between the two groups, age, KTAS (Koran Triage and Acuity Scale),¹¹ chief complaints or diagnosis, times spent at the ED such as the time elapsed from gynecologic consultation to the final disposition, the time elapsed from gynecologic consultation to discharge and the time elapsed from arrival at ED to discharge, and cases with extended stay ≥ 12 h at the ED were analyzed. This study was approved by the Institutional Review Board of Seoul National University College of Medicine in advance (IRB No. 1810-071-979), and the informed consent was waived due to the study's retrospective design.

Statistical analysis

SPSS Statistics for Windows (Version 23.0. Armonk, NY: IBM Corp.) was used for all statistical analyses. Student's t , Mann–Whitney U and Kruskal–Wallis tests were used for analyzing continuous variables, and dichotomous variables were compared with the χ^2 and Fisher's exact tests. A P value of less than 0.05 was regarded as statistically significant.

Results

Table 1 depicts the baseline characteristics between the pre- and post-intervention groups. There were no differences in age, acuity level, and the proportion of benign or malignant conditions between the two groups. In detail, vaginal bleeding and ileus or bowel obstruction were the most common benign and malignant conditions in the pre-intervention (38.5% and 20.7%) and post-intervention groups (39.1% and 25.3%), respectively, and there were no differences in chief complaints or diagnosis between the two groups (data not shown).

Table 2 shows the overall and specific times spent at the ED, where significantly less time was spent in the post-intervention group than in the pre-intervention group despite no difference in the final disposition between the two groups. Moreover, extended stay ≥ 12 h at the ED was less common in the post-intervention group than in the pre-intervention group. Time from initial consultation to final disposition was further analyzed, stratified by disease condition and acuity level measured by KTAS. The hospitalist intervention group showed significantly less waiting time in both benign and malignant conditions compared to pre-intervention resident group. Although there was no difference in the waiting time in KTAS groups 1, 2, and 4, hospitalist intervention significantly reduced the time spent at the ED for KTAS 3 group (median 98 vs 171 min, $P < 0.01$).

Fig. 3 shows the changes in times spent at ED both before and after hospitalist intervention. As a result, times spent at the ED showed a decreasing trend in the post-intervention group over time. When we compared times spent in ED according to the primary doctor in charge for gynecologic consultation, both times elapsed from gynecologic consultation to the final disposition and to discharge were shorter in patients treated by the gynecologic hospitalist than in those treated by the first-, second-, and third-year residents (Table 3). Also, the time taken from patient admission in the general ward to the first written orders were shorter in those consulted by the hospitalist at the ED compared to that of the resident-only group (median 15.3 min vs 40.0 min, respectively, data not shown).

Discussion

This study demonstrates the initial experience of the gynecologic hospitalist's intervention on emergency patients and the

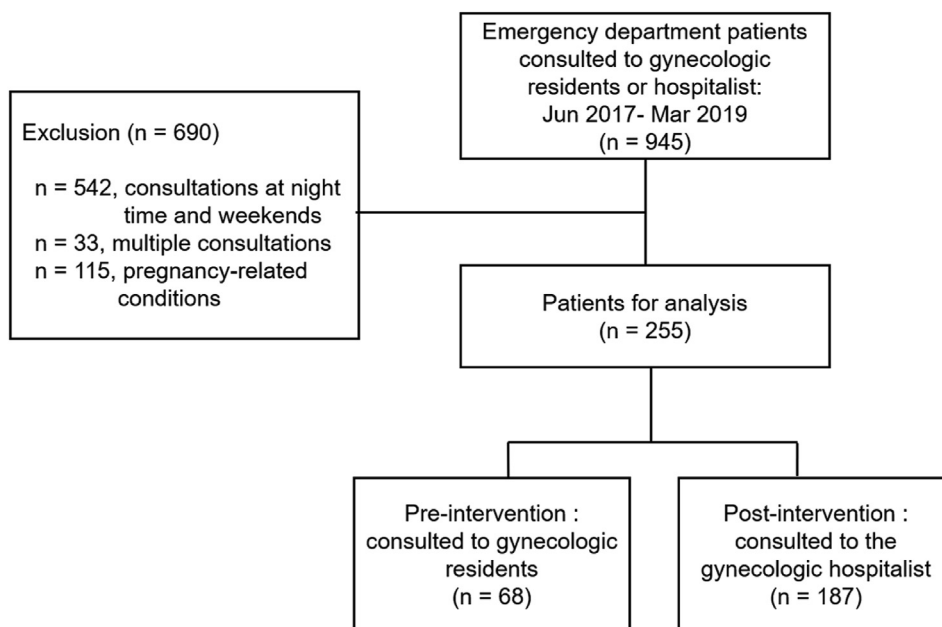


Fig. 1. Flow chart of patients included in this study.

impact on patient waiting times at the ED. The patients' total time spent at the ED and the time from gynecologic consultation to discharge were both significantly reduced by more than 20% in the hospitalist group. The median time taken from the initiation of gynecologic assessment to final decision-making by the hospitalist was also shortened compared to that of the resident group (98.0 vs. 167.5 min, $P < 0.001$). This had brought an impact on the number of extended stays.

Since the introduction of the term 'hospitalist' published in the *New England Journal of Medicine* in 1996, there have been numerous evidence-based studies that support the benefits of hospitalists in the improvement of health care quality, decrease in length of hospital stay, and reduction of healthcare costs in the United States [4,6–12]. The concept of obstetrics and gynecology hospitalist suggested in 2002 was mostly concentrated to obstetric service in the early years. However, the role of obstetrics and gynecology hospitalists could encompass a broader level of service, which included urgent gynecologic care and ED consultations along with obstetric inpatient care [13,14].

Compared to the United States, where hospital medicine had been implemented more than 20 years ago, the hospitalist system in Korea is at its early stage [15]. Therefore, the precise scope and the level of work have not been fully established yet. Moreover, since the number of hospitalists in surgical specialties is relatively low compared to internal medicine, the role of a surgical hospitalist is unclear [16]. Recent interventions such as surgical and ED hospitalists have been introduced with positive feedbacks in other countries [3,9,10]. In a previous study, a designated hospitalist directly addressed boarding patients at the ED to prevent overcrowding and ensure patient safety. As a result, 74.5% of laboratory tests and 79.8% of medications were ordered by the ED hospitalists, and the avoided admission rate was 0.95% in patients intervened on, compared to 0.2% in non-intervened boarders [10]. These findings suggest the hospitalist's impact on bed utilization and timeliness of care as well as quality enhancement.

The results of this study also showed that the hospitalist's intervention could improve the ED throughput by shortening the wait time needed for gynecologic consultation. There are a few reasons for the shorter staying time of patients in the hospitalist

group. The first reason is due to the change in the consultation process. Prior to the hospitalist system, the junior resident at the general ward or the outpatient clinic received calls from the ED physician for gynecologic consultation. Then the resident assessed the patient and notified the clinical fellow and the faculty in charge. This process results in at least 2 to 3 steps before reaching to the final treatment decision. However, this serial notifying process could be eliminated when the hospitalist intervened; after the initial assessment of the patient, the hospitalist would directly notify the faculty in charge. If the condition of the patient is fit for discharge or in need of transfer due to the lack of beds, the hospitalist made independent decisions on the patient's disposition without additional confirmation from other attending doctors. Second, the time needed for decision making was obviously shorter by the hospitalist due to more clinical experience than the training residents. Likewise, the time trend from consultation to final disposition decreased in proportion to the seniority of the primary doctor in charge. In addition, waiting time from the initial consultation to final disposition was noticeably shortened both in benign and malignant conditions in post-intervention group. In regards to acuity level of patient classified by KTAS, significant difference in waiting time before and after hospitalist intervention was found only in the KTAS 3 (urgent) group. This can be explained by the fact that in critical patients (KTAS 1 = resuscitation, KTAS 2 = emergency) requiring urgent intervention such as initial resuscitation or invasive life-saving procedures, physicians from the emergency department intervene first and then consult the gynecologic department. This initial resuscitation process did not differ between the pre and post-intervention period. Also, there was no KTAS 1 patients in the pre-intervention group which makes direct comparison difficult. Nonetheless, the most common acuity level of patients was KTAS 3 (urgent), which represent the real life situation in the emergency department. For KTAS 3 group, hospitalist intervention significantly reduced the waiting time until final disposition. This finding suggests that hospitalist intervention may contribute to expeditious acute care at the ED. The third reason for shorter staying time of patients in the hospitalist group is due to team approach. Working as a team with a junior resident for general ward management allowed the hospitalist to have time to

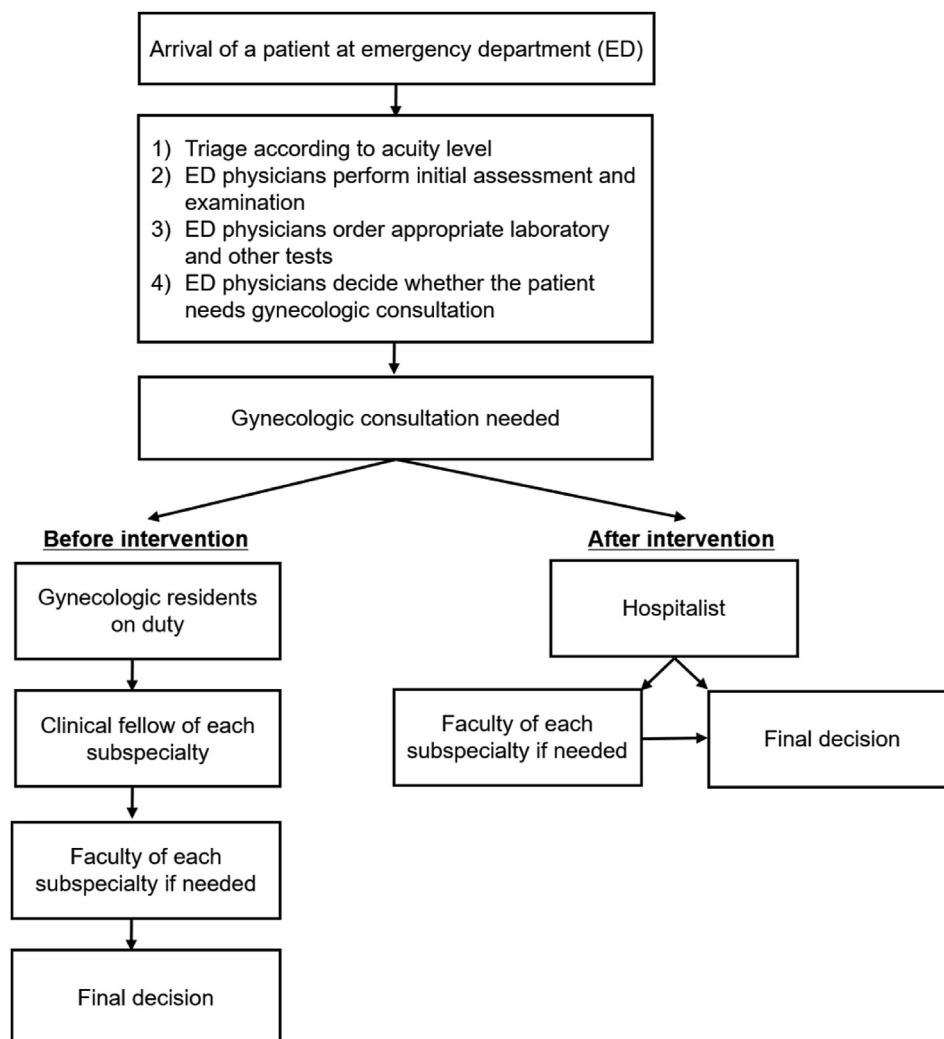


Fig. 2. Flow chart of the gynecologic consultation process at the emergency department.

Table 1
Baseline characteristics.

Characteristics	Pre-intervention (n = 68)	Post-intervention (n = 187)	P value
Age (mean ± SD, y)	47.6 ± 14.3	48 ± 15.5	0.84
KTAS, n (%)			0.30
1	0 (0)	4 (2.1)	
2	9 (13.2)	21 (11.2)	
3	55 (80.9)	136 (72.7)	
4	4 (5.9)	26 (13.9)	
Diagnosis, n (%)			0.27
Benign	39 (57.4)	92 (49.5)	
Malignant	29 (42.6)	94 (50.5)	
Final disposition, n (%)			0.61
Admission	33 (48.5)	88 (47.1)	
Discharge	32 (47.1)	84 (44.9)	
Transfer	3 (4.4)	15 (8.0)	

SD, standard deviation; KTAS, Korean Triage and Acuity Scale; ED, emergency department.

consult emergency patients without jeopardizing the timely care of inpatients. Among 88 patients that were admitted from the ED by the hospitalist, 64 patients (72.7%) received continued inpatient care by the hospitalist team at the general ward. Such continuum of care from the acute phase until discharge is advantageous since no separate handover is needed to a new resident at the general ward,

except at the handoff shifts. Also, more timely orders were given upon admission for those patients transferred to the general ward after the consultation by the hospitalist at the ED compared to the resident-only group (median 15.3 min vs 40.0 min, respectively). A similar form of acute patient management by hospitalists was introduced in a previous study in Korea, where an acute medical

Table 2
Comparison of times spent in the emergency department.

Characteristics	Pre-intervention (n = 68)	Post-intervention (n = 187)	P value
Times spent at the ED, median (range), min			
Consultation to the final disposition	167.5 (32–635)	98 (10–3105)	<0.01
Consultation to discharge	311.5 (51–1839)	205 (38–1638)	<0.01
Arrival to discharge	497 (139–2100)	419 (122–1742)	0.03
Time from consultation to final disposition, median (range), min			
Benign condition	189 (32–635)	102 (10–3105)	<0.01
Malignant condition	137 (32–259)	93 (17–345)	0.01
KTAS 1, 2	104 (51–305)	107 (62–230)	0.98
KTAS 3	171 (32–635)	98 (10–3105)	<0.01
KTAS 4	247 (40–259)	84 (22–410)	0.25
Extended stay ≥12hr at the ED, n (%)	13 (19.1)	18 (9.6)	<0.01

ED, emergency department; KTAS, Korean Triage and Acuity Scale.

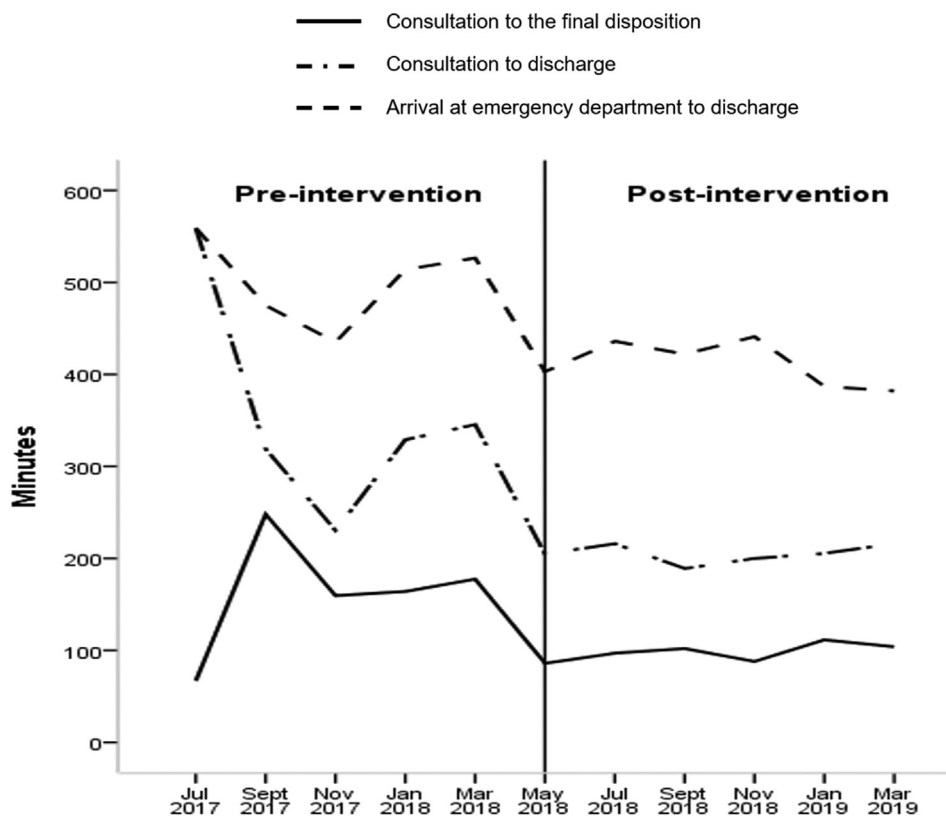


Fig. 3. Trends in the waiting time at the emergency department before and after the hospitalist system. Each line represents the patients' median time spent at the ED in the corresponding month.

Table 3
Comparison of times spent in the emergency department according to the primary doctor in charge for gynecologic consultation.

Times	No. of patients consulted to 1st-year resident (n = 6)	No. of patients consulted to 2nd-year resident (n = 38)	No. of patients consulted to 3rd-year resident (n = 24)	No. of patients consulted to the hospitalist (n = 187)	P value
Consultation to the final disposition	213.5 (129, 625) ^{a,b}	171 (40, 635) ^{a,c}	149 (32, 415) ^{b,c}	97.5 (10, 3105)	<0.01
Consultation to discharge	391 (182, 1574) ^{d,e}	272.5 (128, 1362) ^{d,f}	310.5 (51, 692) ^{e,f}	205.5 (38, 1638)	0.05

All values were represented with median value and range. There is no significant difference between the two groups with the same symbols.

unit (AMU) was run by two internal medicine hospitalists for patients that were admitted through the ED for acute conditions. The hospitalists in charge of the AMU were given full authority regarding the operation policies and decision-making. Similar to

our study, the median length of stay significantly decreased from 10 days to 9.1 days after the establishment of the AMU and the waiting time at the ED was shortened by 40% [17]. Such improvement in patient transition and placing timely orders upon admission are

known to reduce unnecessary delays and improve patients' clinical outcomes [18,19].

This is the first study in Korea to show that the hospitalist's intervention can improve the ED throughput by shortening the wait time needed for gynecologic consultation. Emergency patient consultations were solely provided by the gynecologic hospitalist alone without the participation of the resident. As a result, all patients admitted to the ED during the daytime since May 2018 were primarily consulted by the hospitalist, making pre and post-intervention comparison feasible. As expected, times spent at the ED were significantly shorter in the post-intervention group compared to the pre-intervention group. In particular, both times from consultation to the final disposition and discharge were shorter in patients treated by the hospitalist than in those treated by the first-, second-, and third-year residents. The reason for these findings may be due to the rotation of residents, and thus delayed contact may have been inevitable since residents are usually engaged in other tasks such as operating theatre, outpatient clinic, and procedural room and not designated solely to ED consultations. In contrast, ED physicians could quickly contact and consult the single hospitalist who had been designated to ED consultations.

The limitation of this study is that we performed the study at a single institution with a retrospective and longitudinally pre-post comparison design, which could not be suitable for generalization. Another limitation is that only the daytime gynecologic consultation data were included for analysis since there was only a single hospitalist at our department during the studied time and that other outcomes such as patient and staff satisfaction have not been measured. In addition, cost effective analysis on the impact of hospitalist care was not performed. Although previous literature showed shortened length of stay by hospitalist intervention [20], further studies are needed to compare whether longer waiting times in the resident group outweighs the shorter patient waiting time and higher cost in hiring a gynecologic hospitalist. Despite the above limitations, this is the first study to introduce the gynecologic hospitalist system and analyze the clinical impact on the waiting times for emergency patients. Studies on hospital medicine in Korea are scarce since the system is relatively new, and the implementation rate is still low. Therefore, the results of this study may be used as a reference for future studies and system implementation in hospitalist-naïve centers or countries.

Conclusion

In conclusion, we present the feasibility and positive impact of a gynecologic hospitalist in reducing the wait time and the total length of stay at the emergency department in a high volume tertiary medical center in Korea. Continuous efforts and strategies are required to successfully implement hospital medicine to enhance patient safety.

Funding statement

This study was supported by grants from Seoul National University (No. 800–20170249, 800–20180201, 800–20190437), Seoul National University Hospital (No. 0620173250), and the Korea Health Technology R&D Project through the Korea Health Industry

Development Institute (KHIDI), funded by the Ministry of Health & Welfare, Republic of Korea (No. HI19C0664).

Declaration of competing interest

The authors report no conflict of interest.

Acknowledgements

We would like to express our deep appreciation to the faculty at Seoul National University Hospital, who helped in deriving the results of this study by introducing the first gynecologic hospitalist in Republic of Korea.

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