

faced by many hospitals, costs of wasted inpatient capacity, and negative upstream effects on ED capacity and length of stay [7], our findings have several potential important implications.

First, a multi-disciplinary group utilizing systems engineering techniques can sustainably and significantly improve capacity utilization in a complex academic hospital setting. Secondly, while this success was noted only with our Department of Medicine, such improvements might be generalizable to other services within our hospital. In addition, given the relatively standard process of patient handoff at most hospitals, it is likely these techniques are generalizable to other institutions who could realize similar gains. This pilot study also further underscores the value of using Lean methodologies (including focus on reducing waste in all forms, and decreasing process complexity) to optimize an unnecessarily complex process. We also found that mapping the process with “swim lanes” (a Lean technique in which role group specific actions are explicitly mapped [11]) allowed identification and leveraging of parallel processing opportunities.

Our study has several limitations. First, it is possible that the significant improvement in handoff times were due to other external factors. However, we were unable to identify any such factors and the sustainability of our results suggest otherwise. Second, as a single-center study, our findings may not generalize to hospitals with different handoff processes or underlying technological support systems (e.g. electronic medical records, telecommunication systems, etc.). However, given most handoff processes likely follow a relatively similar course, at least some “lessons learned” might be broadly applicable. Finally, our pilot did not estimate the cost savings associated with improved handoff efficiency and capacity utilization, but in a capacity-constrained system such as ours, a cumulative gain of ~10 bed hours daily is of significant value to the hospital and the ED.

In summary, in this single-center study, a multidisciplinary Lean-based reorganization of patient handoff practices improved performance measures and process efficiency. This represented a cumulative gain of ~10 ED bed hours daily. Broad, multi-centered application of systems engineering science might further improve ED throughput and capacity. Further study should quantify resource use implications.

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Effect of menstrual bleeding on the detection of anogenital injuries in sexual assault victims



The physical examination of sexual assault victims is performed to identify and treat injuries, as well as collect forensic evidence for prosecution. The combination of colposcopy with digital imaging and staining with contrast media such as toluidine blue, has led to reports of genital injury prevalence approaching 90% following nonconsensual sexual intercourse [1]. Such forensic evidence of anogenital injury influences decision making and legal outcomes throughout the criminal justice process. Because the examination is based on scientific evidence, it may influence victims to report their experiences to police, encourage police to file a complaint, and persuade prosecutors to file rape charges and pursue a conviction [2]. For example, McGregor et al. demonstrated that the presence of anogenital trauma was significantly related to filing of charges by the prosecutor as well as conviction [3].

Additional research is needed, however, to understand those factors that might influence the detection of anogenital trauma. For instance, previous investigators have suggested that individuals with darker skin may be at a disadvantage for injury identification with current examination strategies and color awareness may be an important component of the sexual assault forensic examination [4,5]. In addition, the presence of menstrual bleeding might also affect the identification of anogenital injury. Therefore, the purpose of this study was to determine the role of menstrual bleeding in the documentation of anogenital injury following sexual assault.

This was a retrospective, matched (1:4) cohort analysis set in a community-based nurse examiner program (NEP) over an eight-year study period. The study was designed to explore differences in frequency of identified anogenital injuries among menstruating and non-menstruating women. Most patients came from law enforcement dispatch and crisis line contacts. Those sexual assault victims presenting directly to the four city emergency departments were transferred to the NEP for evaluation after triage and initial assessment. The NEP was staffed by 9 forensic nurses trained to perform medical-legal examinations. Sexual assault victims were selected for inclusion in the study if they were currently menstruating and agreed to a forensic examination. This examination consisted of direct visual inspection, 1% toluidine blue contrast application, followed by colposcopy using a Cooper Surgical Leisegang® colposcope system with 30× magnification. After each technique, nurse examiners documented the types and number of anogenital injuries visualized using a standardized classification system [6].

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Each menstruating patient was matched with the next four non-menstruating sexual assault victims presenting to the same clinic using two variables (age, ethnicity). Demographic information, sexual assault history, and clinical findings were retrospectively obtained from NEP records and recorded onto study abstraction forms to guide data collection. Using appropriate safeguards to protect patient confidentiality, medical records were reviewed by one research nurse who was trained using a set of “practice” cases. A second investigator performed a blinded critical review of a random sample of 10% of the charts to determine reliability. The interrater agreement for this sample of charts was significant (k -statistic = 0.93).

A total of 177 cases of sexual assault in menstruating women were identified, representing 9.5% (177/1873) of the women presenting to the NEP. The age range among sexual assault victims was 13 to 47 years (mean, 20.5 ± 12 years). There were no significant differences in marital status, time interval to exam, perpetrator factors, or assault characteristics between the two patient groups (Table 1). A total of 1859 anogenital injuries were documented in the study population. Menstruating women had fewer anogenital injuries compared to non-menstruating victims (58.2% vs. 70.2%, $P = 0.003$). Menstruating women had a smaller incidence of documented anogenital lacerations (25% vs. 36%, $P = 0.007$), and fewer abrasions/ecchymosis (18% vs. 30%, $P = 0.001$). The overall injury pattern was not statistically different; common sites of injury in both groups were posterior, including the fossa navicularis, hymen, fourchette, and labia minora.

This is the first clinical study to evaluate the presence of menstrual bleeding and its effect on the frequency of sexual assault examination findings. We found that menstruating women had 12% (95% CI 4% to 20%) fewer documented anogenital injuries when compared to non-menstruating victims. One explanation for these findings is that sexual assault in non-menstruating women was associated with more violent behavior. However, the victim demographics were similar regarding weapon use, victim incapacitation, non-genital injuries, multiple assailants, or known assailant (Table 1). An alternative but less likely explanation is that hormone levels could have confounding effects through influences on vaginal epithelial and mucosal integrity. However, a recent study in women following consensual sexual intercourse found that among menstruating women, those in the follicular phase were approximately three times more likely to have any external genital injury than those in the luteal or ovulatory phases [7].

Table 1
Patient demographics and assault characteristics (%)

	Menstruating	Non-menstruating
Total	177	708
Age of victim, mean (SD)	20.5 \pm 11 yrs	20.4 \pm 12 yrs
Ethnicity (% white)	136 (76.8)	545 (77.0)
Marital status (% single)	134 (75.7)	525 (74.2)
Last consensual intercourse <72 h	39 (22.0)	179 (25.3)
Time interval to exam, mean (SD)	17 \pm 8 h	18 \pm 9 h
Alcohol or drug use <24 h	79 (44.6)	304 (42.9)
Police report filed	143 (80.8)	595 (84.0)
Known assailant	115 (63.8)	468 (66.1)
Multiple assailants	18 (10.2)	71 (10.0)
Type of sexual assault		
Vaginal	157 (88.7)	651 (91.9)
Oral	37 (20.9)	170 (24.0)
Anal	25 (14.1)	80 (11.3)
Digital	57 (32.2)	209 (29.5)
Type of coercion		
Verbal threats	79 (44.6)	309 (43.6)
Physical	58 (32.8)	215 (30.4)
Restraint used	55 (31.1)	233 (32.9)
Victim sleeping/drugged	43 (24.3)	187 (26.4)
Use of weapons	28 (15.8)	92 (13.0)
Nongenital injuries	85 (48.0)	328 (46.3)
Anogenital injuries*	301 (58.2)	1558 (70.2)
Anogenital injuries, mean (SD)*	1.7 \pm 1.9	2.2 \pm 2.0

* Indicates significance at the $P < 0.05$ level.

The retrospective study design prevented the control for the clinical evaluations by different examiners. It could be that documentation was not uniform, although the nine nurse examiners had a similar level of training and experience. Variability in examination technique and the data that were collected as part of a clinical rather than research protocol both introduce error. The findings of the examiners were recorded on state mandated reporting forms and were taken as the most accurate representation of the actual physical findings. Finally, colposcopic photographs, although generally are reliable at showing acute trauma such as abrasions and lacerations, may not show the subtler findings of erythema, ecchymosis, or swelling of tissues. Despite these limitations, it seems reasonable to conclude that the presence of menstrual blood may mask anogenital injuries such as abrasions, ecchymosis and superficial lacerations. Further prospective research is needed to confirm these findings from a single center.

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Evaluation of abdominal aortic aneurysm in patients with nonvariceal upper gastrointestinal hemorrhage



Although potentially life-threatening, and potentially treatable, primary aortoduodenal fistula (PADF), a disorder most commonly secondary to abdominal aortic aneurysm (AAA), is notable for the absence of its mention in guidelines for management of nonvariceal upper gastrointestinal hemorrhage (NVUGH) [1–4].

Even when “second look” endoscopy is mentioned for recurrent bleeding [5], or surgical intervention is contemplated [6], no mention is made that the precaution should be taken to rule out PADF.

The relationship between AAA and NVUGH is a complex one. Firstly, there is an association between AAA and peptic ulceration [7]. In the