Characteristics and Outcomes of Fasting Orders Among Medical Inpatients

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While many hospitalized patients have orders to fast in preparation for interventions, the extent to which these orders are necessary or adhere to evidence-based durations is unknown. In this study, we analyzed the length, indication, and associated outcomes of nil per os (NPO) orders for general medicine patients at an academic institution in the United States, and compared them to the best available evidence for recommended length of NPO. Of 924 NPO orders assessed, the indicated intervention was not performed for 183 (19.8%) orders, largely due to a change in plan (75/183, 41.0%) or scheduling barriers (43/183, 23.5%). When analyzed by indication, the median duration of NPO orders ranged from 8.3 hours for kidney ultrasound to 13.9 hours for upper endoscopy. For some indications, the literature suggested NPO orders may be unnecessary. Furthermore, in indications for which NPO was deemed necessary in the literature, the duration of most NPO orders was much longer than minimally required. These results suggest the need for establishing more robust practice guidelines or institutional protocols for NPO orders. *Journal of Hospital Medicine* 2017;12:36-39. © 2017 Society of Hospital Medicine

Frequent and prolonged fasting can lead to patient dissatisfaction and distress.[1] It may also cause malnutrition and negatively affect outcomes in high-risk populations such as the elderly.[2] Evidence suggests that patients are commonly kept fasting longer than necessary.[3,4] However, the extent to which nil per os (NPO) orders are necessary or adhere to evidence-based duration is unknown.

Our study showed half of patients admitted to the general medicine services experienced a period of fasting, and 1 in 4 NPO orders may be avoidable.[5] In this study, we aimed to provide action-oriented recommendations by 1) assessing why some interventions did not occur after NPO orders were placed and 2) analyzing NPO orders by indication and comparing them with the best available evidence.

METHODS

This retrospective study was conducted at an academic medical center in the United States. The study protocol was approved by the Mayo Clinic Institutional Review Board.

Detailed data handling and NPO order review processes have been described elsewhere.[5] Briefly, we identified 1200 NPO orders of 120 or more minutes' duration that were written for patients on the general medicine services at our institution in 2013. After blinded duplicate review, we excluded 70 orders written in the intensive care unit or on other services, 24 with unknown indications, 101 primarily indicated for clinical reasons, and 81 that had multiple indications. Consequently, 924 orders indicated for a single intervention (eg, imaging study, procedure, or operation) were included in the main analysis.

We assessed if the indicated intervention was performed. If performed, we recorded the time when the intervention was started. If not performed, we assessed reasons why it was not performed. We also performed exploratory analyses to investigate factors associated with performing the indicated intervention. The variables were 1) NPO starting at midnight, 2) NPO starting within 12 hours of admission, and 3) indication (eg, imaging study, procedure, or operation). We also conducted sensitivity analyses limited to 1 NPO order per patient (N = 673) to assess independence of the orders.

We then further categorized indications for the orders in detail and identified those with a sample size >10. This resulted in 779 orders that were included in the analysis by indication. We reviewed the literature by indication to determine suggested minimally required fasting durations to compare fasting duration in our patients to current evidence-based recommendations.

For descriptive statistics, we used median with interquartile range (IQR) for continuous variables and percentage for discrete variables; chi-square tests were used for comparison of discrete variables. All P values were two-tailed and $P < 0.05$ was considered significant.

RESULTS

Median length of 924 orders was 12.7 hours (IQR, 10.1-15.7 hours); 190 (20.1%), 577 (62.4%), and 157 (21.0%) orders were indicated for imaging studies, procedures, and operations, respectively. NPO started at midnight in 662 (71.6%) and within 12 hours of admission in 210 (22.7%) orders.

The indicated interventions were not performed in 183 (19.8%) orders, mostly as a result of a change in plan (75/183, 41.0%) or scheduling barriers (43/183, 23.5%). Plan chang-

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TABLE 1. Characteristics of NPO Orders Written for Interventions among Medical Inpatients

	All NPO orders	NPO started at midnight	NPO started within 12 hr of admission
N orders	924	662	210
N patients	673	458	204
Length, hours (median, IQR)	12.7 (10.1-15.7)	13.4 (11.4-15.9)	12.8 (10.1-16.3)
Indication (n, %)			
Total	924	662	210
Imaging study	190 (20.1%)	123 (18.6%)	40 (19.0%)
Procedure	577 (62.4%)	418 (63.1%)	146 (69.5%)
Operation	157 (17.0%)	121 (18.3%)	24 (11.4%)
Performed (n, %)			
Total	924	662	210
Yes	741 (80.2%)	546 (82.5%)	140 (66.7%)
No	183 (19.8%)	116 (17.5%)	70 (33.3%)
Why not performed (n, %)			
Total	183	116	70
Deemed unnecessary	105 (57.4%)	65 (56.0%)	42 (60%)
Plan changed	75	47	28
Clinically improved	29	18	14
Other	1	0	0
Needed but could not be performed	78 (42.6%)	51 (44.0%)	28 (40%)
Not available/fully booked	37	17	15
Elevated INR/high bleeding risk	13	11	8
Conflicts with other tasks/tests	6	5	3
Clinically unstable	5	5	0
Patient ate	1	1	0
Unknown	4	4	0
Other	12	8	2

NOTE: Abbreviations: hr, hours; INR, international normalized ratio, IQR, interquartile range, NPO, nil per os.

es occurred when, for example, input from a consulting service was obtained or the supervising physician decided not to pursue the intervention. Scheduling barriers included slots being unavailable and conflicts with other tasks/tests. Notably, only in 1 of 183 (0.5%) orders, the intervention was cancelled because the patient ate (Table 1).

NPO orders starting at midnight were associated with higher likelihood of indicated interventions being performed (546/662, 82.5% vs. 195/262, 74.4%; $P = 0.006$), as were NPO orders starting more than 12 hours after admission (601/714, 84.2% vs. 140/210, 66.7%; $P < 0.001$). Imaging studies were more likely to be performed than procedures or operations (170/190, 89.5% vs. 452/577, 78.3% vs. 119/157, 75.8%; $P = 0.001$). These results were unchanged when the analyses were limited to 1 order per patient.

When analyzed by indication, the median durations of NPO orders ranged from 8.3 hours in kidney ultrasound to 13.9 hours in upper endoscopy. These were slightly shortened, most by 1 to 2 hours, when the duration was calculated from start of the order to initiation of the intervention. The literature review identified, for most indications, that the minimally required length of NPO were 2 to 4 hours, generally 6 to 8 hours shorter than the median NPO length in this study sample. Furthermore, for indications such as computed tomography with intravenous contrast and abdominal ultrasound, the literature suggested NPO may be unnecessary (Table 2).[6-9,16-30]

DISCUSSION

We analyzed a comprehensive set of NPO orders written for interventions in medical inpatients at an academic medical center. NPO started at midnight in 71.6% of the analyzed orders. In 1 in 5 NPO orders, the indicated intervention was not performed largely due to a change in plan or scheduling barriers. In most NPO orders in which the indicated interventions were performed, patients were kept fasting either unnecessarily or much longer than needed. This study is the first of its kind in evaluating NPO-ordering practices across multiple indications and comparing them with the best available evidence.

These results suggest current NPO practice in the hospital is suboptimal, and limited literature measures the magnitude of this issue.[6,7] An important aspect of our study findings is that, in a substantial number of NPO orders, the indicated interventions were not performed for seemingly avoidable reasons. These issues may be attributable to clinicians' preemptive decisions or lack of knowledge, or inefficiency in the healthcare system. Minimizing anticipatory NPO may carry drawbacks such as delays in interventions, and limited evidence links excessive NPO with clinical outcomes (eg, length of stay, readmission, or death). However, from the patients' perspective, it is important to be kept fasting only for clinical benefit. Hence, this calls for substantial improvement of NPO practices.

Furthermore, results indicated that the duration of most

TABLE 2. Characteristics of NPO Orders by Indication and Required Minimal Length of NPO by Literature

		All NPO orders		NPO orders in which the indicated intervention was performed		
Indication		N	Median length (IQR, hr)	N	Median length (IQR, hr)[a]	Minimally needed NPO length[b]
Total		779	12.8 (10.2-15.9)	624	10.9 (8.7-13.6)	
Imaging study	Transesophageal echocardiography	38	12.7 (11.1-14.4)	34	9.8 (8.7-11.6)	3 hr[16,17]
	Abdominal ultrasound	29	8.8 (5.4-12.1)	29	7.0 (3.1-11.1)	Need for fasting unclear[18,19]
	Kidney ultrasound	27	8.3 (5.2-13.1)	24	8.1 (3.7-10.0)	No fasting[20 c]
	CT with IV contrast	22	11.1 (9.4-15.0)	16	10.8 (8.1-13.7)	No fasting[6,11]
	PET/CT	15	12.0 (7.6-16.1)	15	11.2 (7-14.7)	4 hr[21]
Procedure	Upper endoscopy	119	13.9 (11.4-16.7)	92	10.4 (8.2-13.0)	2 hr[9,10,22]
	CT-guided line placement (not involving GI tract)	82	13.5 (10.0-16.2)	66	12.5 (9.6-14.8)	No fasting[7] or 2 hr[8,23]
	CT/US-guided aspiration/biopsy	73	12.9 (10.6-15.2)	54	11.6 (10.4-14.8)	No fasting[7] or 2 hr[8,23]
	Colonoscopy	63	13.4 (10.9-17.5)	50	11.4 (9.6-14.9)	2 hr[24,25]
	Bronchoscopy	41	12.1 (10.3-15.4)	23	11.1 (9.9-15.0)	2 hr[8,26]
	Conscious sedation[d]	34	13.3 (10.9-16.2)	33	11.6 (9.9-13.0)	No fasting[7] or 2 hr[8,23]
	Angiogram/ venogram	26	13.8 (8.4-15.9)	22	11.7 (7.1-12.8)	No fasting[7] or 2 hr[8,23]
	US-guided thoracentesis	19	10.3 (7.2-12.9)	18	9.3 (6.8-10.9)	No fasting[27]
	US-guided paracentesis	18	11.3 (10.4-14.4)	16	11.0 (8.0-13)	No fasting[28]
	ERCP	16	12.9 (11.4-17.5)	12	9.1 (7.8-13.1)	No study[e]
Operation		157	13.6 (10.6-17.4)	119	11.6 (8.7-14.1)	2 hr[8]

[a] Duration calculated from the starting time of the NPO order to that of the intervention.

[b] Minimally required NPO length was obtained from the best available evidence found in the literature search. Note that these lengths apply only to clear liquids in general.

[c] Fasting for 8-12 hours may be required for arterial examination by Doppler ultrasound.[29,30]

[d] Included are MRI, bone marrow biopsy, and wound VAC exchange that were ordered with conscious sedation by anesthesia support.

[e] Generally, patients are made NPO for more than 6 to 8 hr.

NOTE: Abbreviations: CT, computed tomography; ERCP, endoscopic retrograde cholangiopancreatography; GI, gastrointestinal; hr, hours; IQR, interquartile range; IV, intravenous; MRI, magnetic resonance imaging; NPO, nil per os; PET, positron emission tomography; US, ultrasound; VAC, vacuum-assisted closure.

NPO orders was longer than the minimal duration currently suggested in the literature. Whereas strong evidence suggests that no longer than 2 hours of fasting is generally required for preoperative purposes,[8] limited studies have evaluated the required length of NPO orders in imaging studies and procedures,[9-11] which comprised most of the orders in the study cohort. For example, in upper endoscopy, 2 small studies suggested fasting for 1 or 2 hours may provide as good visualization as with the conventional 6 to 8 hours of fasting.[9,10] In coronary angiography, a retrospective study demonstrated fasting may be unnecessary.[11] Due to lack of robust evidence, guidelines for these interventions either do not specify the required length of fasting or have not changed the conventional recommendations for fasting, leading to large variations in fasting policies by institution.[6,12] Therefore, more studies are needed to define required length of fasting for those indications and to measure the exact magnitude of excessive fasting in the hospital.

One of the limitations of this study is generalizability because NPO practice may considerably vary by institution as suggested in the literature.[4,6,12] Conversely, studies have suggested that excessive fasting exists in other institutions.[3,4,13] Thus, this study adds further evidence of the prevalence of suboptimal NPO practice to the literature and provides a benchmark that other institutions can refer to when evaluating their own NPO practice. Another limitation is the assumption that the evidence for minimally required NPO duration can be applied to our patient samples. Specifically, the American Society of Anesthesiologists guideline states that preoperative or preprocedural fasting may need to be longer than 2 hours for 1) patients with comorbidities that can affect gastric emptying or fluid volume such as obesi-

ty, diabetes, emergency care, and enteral tube feeding, and 2) patients in whom airway management might be difficult.[8] We did not consider these possibilities, and as these conditions are prevalent in medical inpatients, we may be overstating the excessiveness of fasting orders. On the other hand, especially in patients with diabetes, prolonged fasting may cause harm by inducing hypoglycemia.[14] Further, no study rigorously evaluated safety of shortening the fasting period for these subsets of patients. Therefore, it is necessary to establish optimal duration of NPO and to improve NPO ordering practice even in these patient subsets.

While more research is needed to define optimal duration of NPO for various interventions and specific subsets of patients and to establish linkage of excessive NPO with clinical outcomes, our data provide insights into immediate actions that can be taken by clinicians to improve NPO practices using our data as a benchmark. First, institutions can establish more robust practice guidelines or institutional protocols for NPO orders. Successful interventions have been reported,[15] and breaking the habit of ordering NPO after midnight is certainly possible. We recommend each institution does so by indication, potentially through interdepartmental work groups involving appropriate departments such as radiology, surgery, and medicine. Second, institutional guidelines or protocols can be incorporated in the ordering system to enable appropriate NPO ordering. For example, at our institution, we are modifying the order screens for ultrasound-guided paracentesis and thoracentesis to indicate that NPO is not necessary for these procedures unless sedation is anticipated. We conclude that, at any institution, efforts in improving the NPO practice are urgently warranted to minimize unnecessary fasting.

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