

## BACKGROUND

- Increased duodenal acid exposure may be a mechanism for symptoms in functional dyspepsia but is rarely measured clinically.
- Wireless motility capsules (WMC) measure GI transit in patients with suspected dysmotility but also can quantify pH throughout the small bowel (SB).
- There is substantial overlap of symptoms in functional dyspepsia and gastroparesis.
- WMC measures of small bowel pH have not been related to severity of dyspepsia symptoms in patients with suspected gastroparesis.

## AIMS OF STUDY

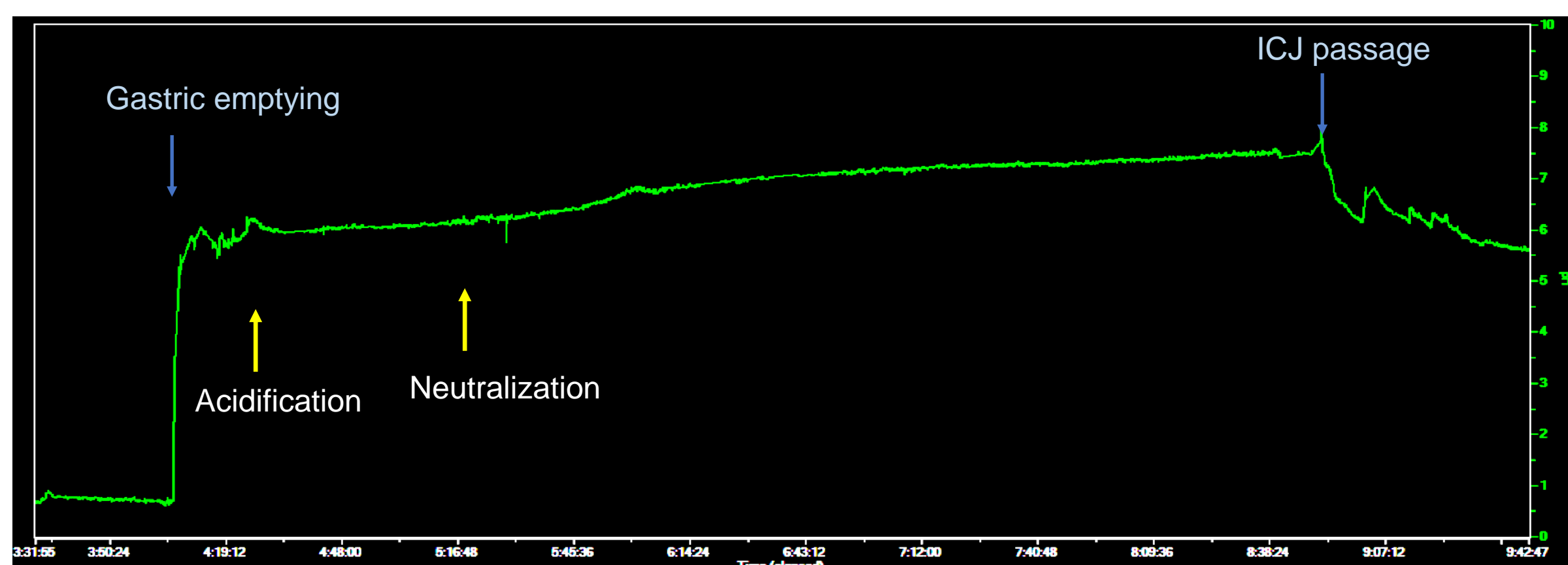
- To relate small bowel pH to severity of epigastric pain and nausea/vomiting in patients with suspected gastroparesis.
- To devise an estimate of delayed duodenal neutralization as a possible marker of increased duodenal acid exposure in patients with greater dyspeptic symptoms.

## METHODS

- 91 patients with symptoms suspicious for gastroparesis from a parent study of concurrent WMC and scintigraphy gastric emptying testing had interpretable SB pH recordings.
- WMC small bowel pH was measured from the time of gastric emptying (detected as abrupt 2 pH unit increase after eating) to ileocecal junction passage.
- Dyspepsia symptoms were scored from 0=no symptoms to 5=very severe symptoms:
  - Epigastric pain scores were calculated from Patient Assessment of Upper GI Symptoms survey.
  - Nausea/vomiting scores were calculated from Gastroparesis Cardinal Symptom Index survey
- Duodenal pH neutralization profiles:
  - Normal—initial rapid pH decrease followed by rapid increase starting within 30 minutes of gastric emptying
  - Delayed—initial delayed pH decrease followed by slower pH increase (mean pH after 30 min is less than mean pH at 15 min after gastric emptying)

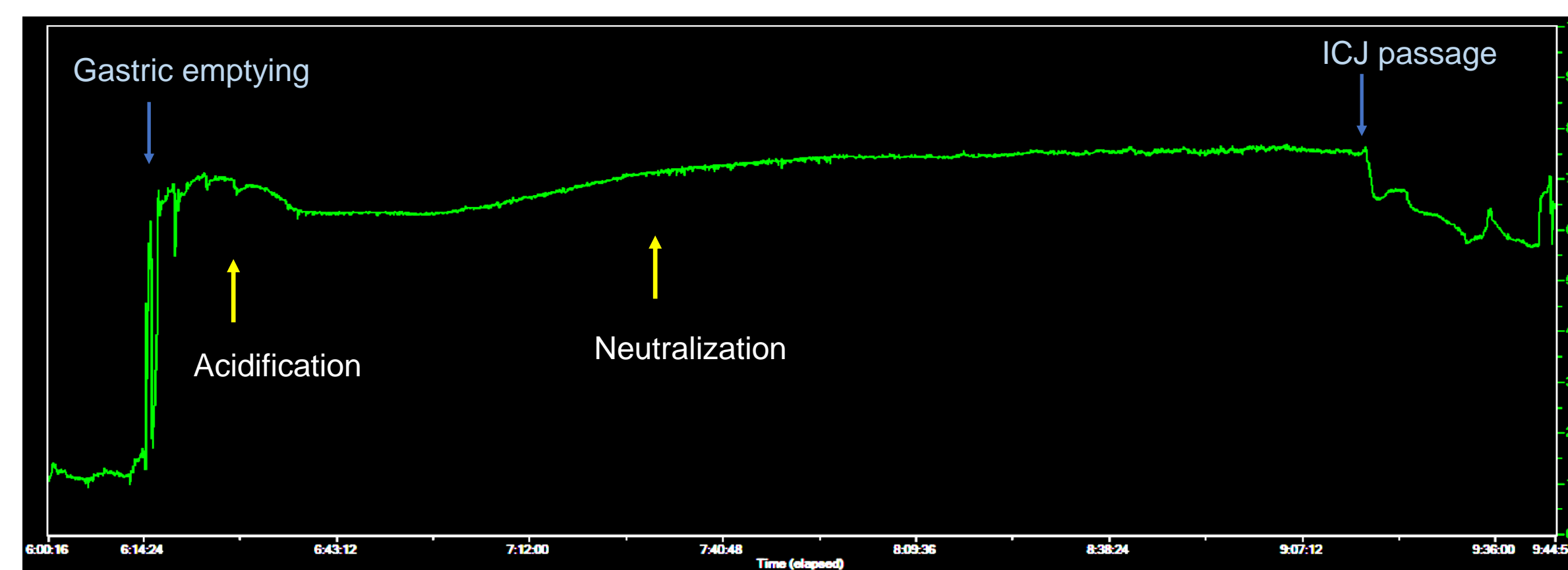
## SAMPLE WMC DUODENAL pH TRACINGS WITH AND WITHOUT DELAYED NEUTRALIZATION

### BRIEF ACIDIFICATION THEN RAPID NEUTRALIZATION



Epigastric pain score = 0  
Nausea/vomiting score = 1  
Acidification time = 49 min  
Max pH decrease = 0.50

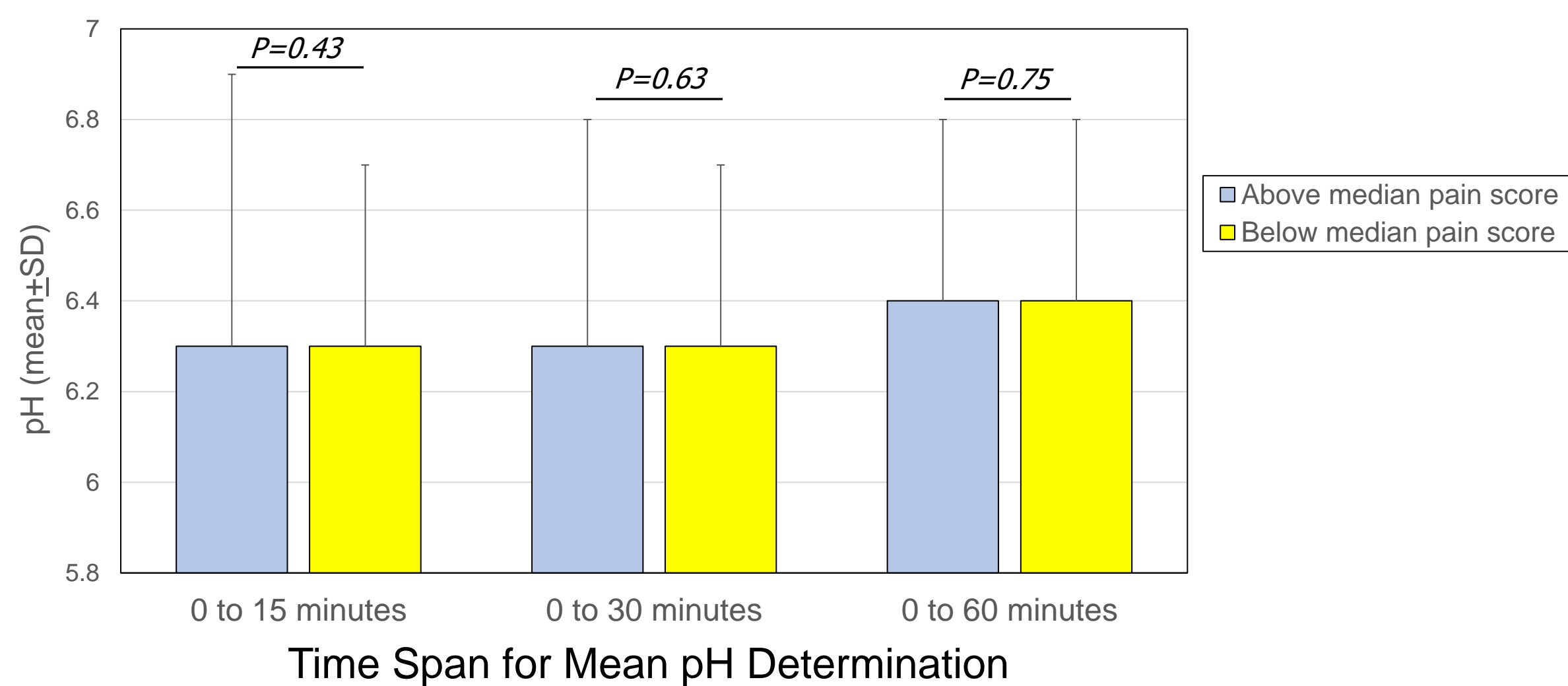
### SLOW ACIDIFICATION THEN DELAYED NEUTRALIZATION



Epigastric pain score = 4  
Nausea/vomiting score = 1.67  
Acidification time = 64 min  
Max pH decrease = 0.93

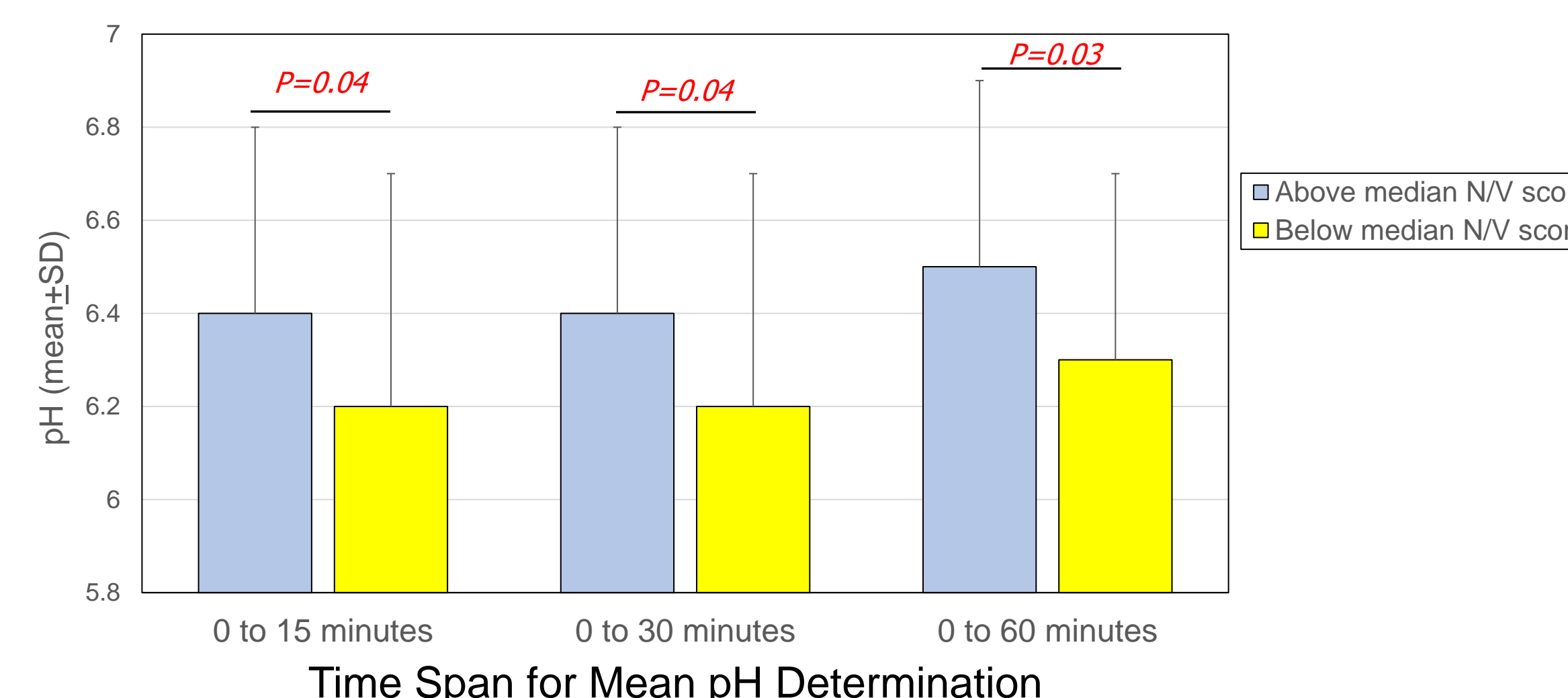
**Figure 1:** These pH recordings show two different profiles—one with rapid acidification and rapid neutralization (left) and one with slower acidification and delayed neutralization (right). The recording with delayed neutralization was associated with greater baseline epigastric pain, longer acidification time, and greater maximal pH decrease after entering the duodenum.

## DUODENAL pH PROFILES IN RELATION TO EPIGASTRIC PAIN SEVERITY



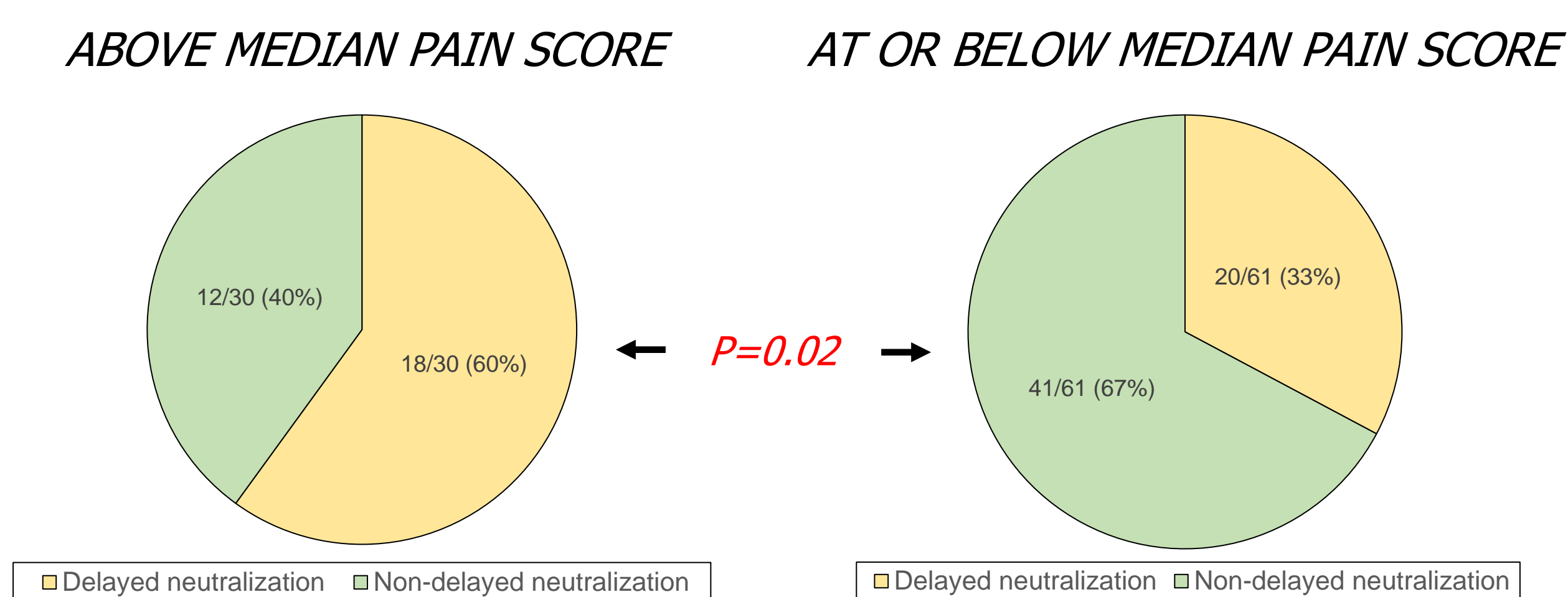
**Figure 2:** When taking the overall group as a whole, there were no differences in duodenal pH values in relation to epigastric pain severity.

## DUODENAL pH PROFILES IN RELATION TO NAUSEA/VOMITING SEVERITY



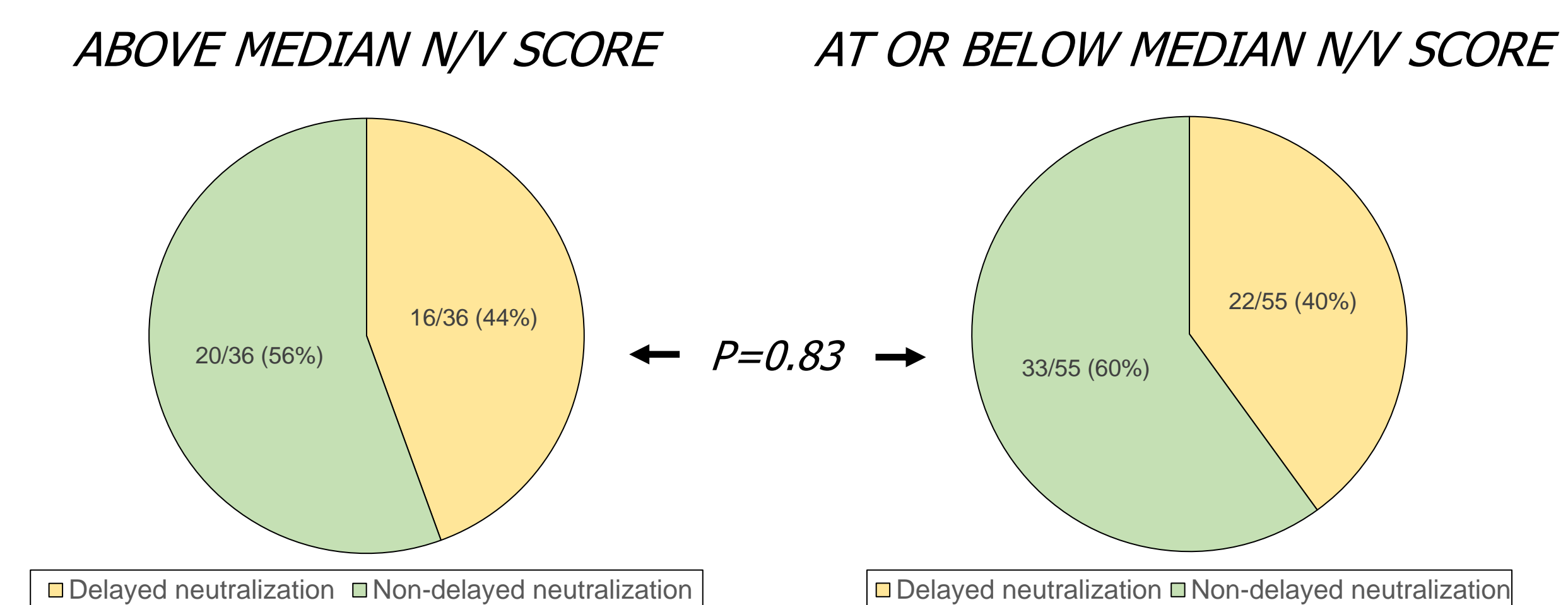
**Figure 3:** In contrast to Figure 2 when taking the overall group as a whole, duodenal pH was higher for patients with higher nausea/vomiting scores at all time points.

## PROPORTION WITH DELAYED NEUTRALIZATION IN RELATION TO EPIGASTRIC PAIN SEVERITY



**Figure 4:** Although duodenal pH was similar in relation to pain severity in the whole group, more patients with pain scores above median exhibited delayed neutralization compared to those with lower pain scores raising the possibility of prolonged acid exposure in this subset.

## PROPORTION WITH DELAYED NEUTRALIZATION IN RELATION TO NAUSEA/VOMITING SEVERITY



**Figure 5:** Although overall pH was higher in patients with higher N/V scores, there was no difference in the proportion who did and did not exhibit delayed neutralization in relation to nausea/vomiting severity. In contrast to epigastric pain, there was no subset with higher N/V scores who potentially exhibited increased acid exposure.

## MEDIAN BASELINE SYMPTOM SCORES

Symptom	Median	IQR
Epigastric pain	2.00	1.00, 3.00
Nausea/vomiting	1.33	0.67, 2.67

**Table:** These were the baseline symptom severities reported by the whole group as median ± interquartile range (IQR).

## CONCLUSIONS

- Duodenal pH profiles in patients with suspected gastroparesis relate to symptom severity and vary depending on which symptom is reported.
- Compared to milder symptoms, severe nausea/vomiting is associated with increased duodenal pH and little delay in duodenal neutralization.
- Increased duodenal pH is not seen overall with severe epigastric pain.
- However, a subset of patients with severe epigastric pain exhibits delayed initial duodenal pH decreases followed by slow neutralization.

## IMPLICATIONS

- These findings raise the possibility that increased duodenal acid exposure may be present in a subgroup of patients with suspected gastroparesis with more severe epigastric pain.
- Verification of a pathogenic role of duodenal acidification in symptom generation in suspected gastroparesis is a topic of future investigation.

## DISCLOSURES

- The parent study was funded by Medtronic.
- Dr. Semler was an independent contractor for Medtronic for these analyses.