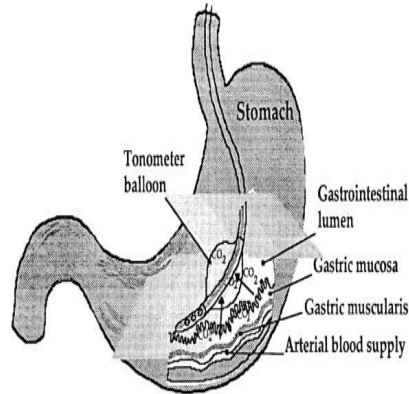




## Assessing the Effectiveness of Gastric Tonometry Guided Therapy



A low intramucosal pH (pHi) and an increase in the difference between gastric mucosal and arterial  $P_{CO_2}$  ( $P_{CO_2}$  gap) reflect splanchnic hypoperfusion and are good indicators of poor prognosis. Previously, some randomised controlled trials (RCTs) were performed based on the theory that normalising the low pHi or  $P_{CO_2}$  gap could improve the outcomes of critical care patients. However, these RCTs yielded divergent results about the benefits derived from this goal-oriented therapy.

To assess the effectiveness of gastric tonometry guided therapy, Zhang X et al. performed a systematic review on whether this goal-oriented therapy yields measurable benefits in critical care patients. They found that this therapy could reduce total mortality in critical care patients.

However, after excluding the patients with normal pHi on admission, the researchers noted that the beneficial effects of this therapy did not exist, indicating that these patients may be more sensitive to this treatment. The findings are published in the journal *Critical Care*.

### Materials and Methods

The investigators searched PubMed, EMBASE, the Cochrane Library and ClinicalTrials.gov for RCTs comparing gastric tonometry guided therapy with control groups. They identified 11,014 citations. After restricting article type to RCT or trial, 10,413 studies were excluded. However, according to the inclusion and exclusion criteria, only six RCTs were selected for this systematic review and meta-analysis.

The inclusion criteria were: adult patients admitted to ICU; studies in which patients were randomly divided into at least two groups, including a group of patients being treated with the intent to normalise the value of pHi or  $P_{CO_2}$  gap. The authors excluded research that was updated in a latter published paper or was designed as a historical controlled trial.

Baseline characteristics (population, mean age, APACHE II scores on admission, intervention, current treatment, number of patients, outcomes used in the meta-analysis) were extracted.

Primary outcomes were hospital mortality, total mortality and ICU mortality. The secondary outcomes were ICU length of stay, hospital length of stay and days intubated. All the included RCTs provided survival rate or mortality rate; survival rates were transformed into mortality rates for this study.

The authors calculated pooled odds ratios (ORs) with 95% confidence intervals (CIs) for dichotomous outcomes. Another measure of effect (risk difference, RD) was used to reassess the effects of gastric

tonometry on total mortality. Sensitivity analysis for total mortality and subgroup (patients with or without normal admission pHi) analysis for ICU mortality and hospital mortality were performed to explore whether gastric tonometry had significant effects on specific group of patients. Continuous outcomes were presented as standardised mean differences (SMDs) together with 95% CIs.

## Results and Discussion

The gastric tonometry guided therapy significantly reduced total mortality (OR, 0.732; 95% CI, 0.536 to 0.999,  $P = 0.049$ ;  $I^2 = 0\%$ ; RD,  $-0.056$ ; 95% CI,  $-0.109$  to  $-0.003$ ,  $P = 0.038$ ;  $I^2 = 0\%$ ) when compared with control groups. However, after excluding the patients with normal pHi on admission, the beneficial effects of this therapy did not exist (OR, 0.736; 95% CI 0.506 to 1.071,  $P = 0.109$ ;  $I^2 = 0\%$ ).

ICU length of stay, hospital length of stay and days intubated were not significantly improved by this therapy. This may be the case that the effects of gastric tonometry guided therapy are not apparent and require a relative big sample size to be detected.

Through this meta-analysis, the authors found that improving pHi could reduce total mortality in critical care patients. One RCT reported that their failure to improve the outcome may be caused by inability to produce a significant change of pHi. Therefore, exploring which kind of method could improve the pHi or PCO<sub>2</sub> gap is important.

## Conclusions

Gastric tonometry guided therapy can reduce total mortality in critical care patients. Patients with normal pHi on admission partially drive the ultimate combined results of total mortality — it may indicate that these patients may be more sensitive to this therapy.

Gastric tonometry guided therapy may be more effective in some specific critical care patients. Treatments that improve organ microcirculation may be recommended for resuscitation of critical care patients if not contraindicated.

Image Credit: *CHEST Journal*/American College of Chest Physicians

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