BIBLIOGRAPHY

Gastric pH, GI Tract Bleeding, and Acid Suppression Therapy in Pediatric Patients

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GASTRIC PH AND GI TRACT BLEEDING

Crill CM, Hak EB. Upper gastrointestinal tract bleeding in critically ill pediatric patients. Pharmacotherapy 1999;19:162-180.

This paper discusses developmental issues that affect the occurrence and prophylaxis of upper gastrointestinal tract bleeding in pediatric patients. It reviews the diagnosis, frequency, and risk factors for this disorder, while noting differences between pediatric and adult patients. A review of nonpharmacological and pharmacological prophylaxis and treatment is presented, complete with dosing guidelines and pharmacokinetic data. The authors incorporated economic and monitoring issues, while making recommendations for therapy.

Chaibou M, Tucci M, Dugas M. Clinically significant upper gastrointestinal bleeding acquired in a pediatric intensive care unit: A prospective study. Pediatrics 1998;102:933-938.

This prospective, descriptive epidemiological study enrolled 1114 patients consecutively admitted to the pediatric intensive care unit. Of the patients included in the analysis, 103 had upper GI bleeding, with 16 having clinically significant bleeds. Complications associated with the upper GI bleeding included decreased hemoglobin concentrations, transfusion, hypotension, and surgery. Respiratory failure, coagulopathy, and pediatric risk mortality score >10 independently correlated as risk factors. The authors concluded that clinically significant upper GI bleeds are rare in critically ill children and prophylaxis should be limited to patients with at least 2 risk factors.

Cochran EB, Phelps SJ, Tolley EA. Prevalence of, and risk factors for, upper gastro-intestinal tract bleeding in critically ill pediatric patients. Crit Care Med 1992;20:1519-1523.

This prospective, descriptive, comparative study followed 208 patients < 19 years of age who were admitted to the pediatric intensive care unit. Patients were evaluated for upper GI bleeding as evident by coffee-ground or bright red gastric aspirates or tarry stools. Patients who had received medication that would alter their risk of GI bleeding were excluded. Of the patients evaluated, 25% had evidence of upper GI bleeding.

Lacroix J, Nadeau D, Laberge S. Frequency of upper gastrointestinal tract bleeding in a pediatric intensive care unit. Crit Care Med 1992;20:35-42.

This prospective, descriptive study monitored all children admitted to a pediatric intensive care unit over a 55-week period. Upper GI bleeding was considered present if there was hematemesis or blood noted in the nasogastric tube drainage. Out of 984 patients, 63 had up-

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per GI bleeds. These bleeds occurred in 5.2% of patients (698) not receiving prophylaxis and 9.4% of patients (286) receiving prophylaxis. There were 10.8 GI bleeds per 1000 patient days. Clinically important GI bleeds were defined as those involving hypotension, death or transfusion within 24 hours. There were 4 clinically important GI bleeding episodes. The study concluded that while upper GI bleeding is frequent, clinically important episodes are rare.

Cook DJ, Fuller HD, Guyatt GH. Risk factors for gastrointestinal bleeding in critically ill patients. Canadian Critical Care Trials Group. N Engl J Med 1994;330:337-381.

This prospective, multi-center, cohort study evaluated potential risk factors for stress. Clinically significant bleeding was defined as overt bleeding with hemodynamic compromise or the need for a transfusion. Of the 2252 patients evaluated, 1.5% had clinically important bleeding. Respiratory failure and coagulopathy were identified as two risk factors for bleeding. Of the 847 patients who had one or both of these risk factors, 31% had clinically significant bleeding. The mortality rate for those with clinically significant bleeding was 48.5% versus 2% in the group without clinically significant bleeding.

Gauvin F, Dugas MA, Chaibou M, et al. The impact of clinically significant upper gastrointestinal bleeding acquired in a pediatric intensive care unit. Pediatr Crit Care Med 2001;2:294-298.

This prospective, case-control-within-cohort study evaluated all patients who were consecutively admitted to the pediatric intensive care unit over a 1-year period. Patients were divided into three groups: clinically significant upper GI bleeds, non-significant GI bleeds, and no GI bleeds. The clinically significant GI bleed group had a significantly higher rate of blood transfusions, duration of ventilation, length of pediatric intensive care unit stay, and a lower hemoglobin level. There was no difference between the not-significant GI bleed and no bleed groups. There was a significantly higher cost associated with the clinically significant GI bleed group.

Kuusela AL, Maki M, Ruuska T, et al. Stress-induced gastric findings in critically ill newborn infants: frequency and risk factors. Intensive Care Med 2000;26:1501-1506.

This study included both a retrospective chart review and a prospective look at the identified population. The chart review included 100 consecutive newborn infants that were reviewed for gastrointestinal bleeding and risk factors. Mechanical ventilation was the only risk factor identified in the 20% of infants with signs of GI bleeding. Part two of the study looked at 89 ventilated infants who underwent endoscopy for further risk factors for gastric mucosal lesions. Fifty-three percent of these infants had remarkable lesions, with three more risk factors being identified (abnormal or delayed delivery and hypotension after birth).

H_2-RECEPTOR BLOCKERS

Gedeit RG, Weigle CG, Havens PL, et al. Control and variability of gastric pH in critically ill children. Crit Care Med 1993;21:1850-1855.

This prospective, descriptive study looked at 14 pediatric intensive care patients receiving 4 mg/kg/day of ranitidine. Patients were divided into 2 groups based on illness type and severity. Gastric pH was monitored continuously using an intragastric pH probe, with poor gastric pH control being defined as pH < 4 for > 20% of the study period. Poor control occurred in 100% of patients classified as having a severe illness or acute CNS injury, while only 20% of the less severely ill patients had poor control. When gastric pH variability was analyzed, patients receiving bolus doses had more variability than those receiving continuous infusion therapy. This study concluded that: type and severity of illness may predict ranitidine response, continuous infusion ranitidine decreased pH variability, gastric pH monitoring may be inaccurate due to variability, and children with acute CNS injury or higher illness severity scores have poor control of gastric pH.

Abdel-Rahman SM, Johnson FK, Manowitz N, et al. Single-dose pharmacokinetics of nizatidine (Axid) in children. J Clin Pharmacol 2002;42:1089-1096.

This open-label, single-dose pharmacokinetic trial collected data on 12 healthy patients between the ages of 1 and 12 years and within the 25th to 75th percentile for body weight. Five blood draws were collected in the 12-hour period following a single 5 mg/kg oral dose given as a liquid formulation in apple juice. The terminal elimination rate constant in these pediatric patients was equivalent to previous adult data (0.58 ± 0.8 hr vs. 0.54 ± 0.13 hr). Plasma concentrations in pediatric patients following the dose exceeded the EC_{50} value for gastric acid suppression from adult studies for approximately 6 hours. The AUC suggested a 15% metabolic conversion of the parent drug.

Harrison AM, Lugo RA, Vernon D. Gastric pH control in critically ill children receiving intravenous ranitidine. Crit Care Med 1998;26:1433-1436.

This prospective study enrolled 50 consecutive patients who received at least 24 hours of intermittent ranitidine for stress ulcer prophylaxis to determine if the recommended dose of ranitidine (2-4 mg/kg/day IV) resulted in gastric pH control. Gastric pH was determined at the end of the dosing interval, 1 hour after a dose, and at the midpoint of the dosing interval using pH paper. Gastric pH control was considered unsuccessful if the pH was < 4 for any of the time points. Gastric pH was poorly controlled in 36% of patients. This percentage seemed to be dose-related, with 71% of patients receiving < 3 mg/kg/day having poor pH control versus 19% who received a minimum of 3 mg/kg/day. The study concluded that critically ill children with normal renal and hepatic function should be treated with at least 3 mg/kg/day IV, with the dose being titrated to a gastric pH of at least 4.

Treem WR, Davis PM, Hyams JS. Suppression of gastric acid secretion by intravenous administration of famotidine in children. J Pediatr 1991;118:812-816.

This study evaluated famotidine dosing in 18 pediatric intensive care patients between the ages of 2 to 69 months to find appropriate dosing requirements for IV famotidine in pediatric patients. Patients were initially given a 0.4 mg/kg dose, which was not repeated until gastric pH dropped to < 4 for > 2 hours. Gastric pH measurements were taken by intragastric pH probes. Increasing doses were given (0.8 mg/kg, 1.2 mg/kg, and 1.6 mg/kg) if the previous dose failed to raise the gastric pH to > 4 for > 6 hours. The study concluded that IV famotidine raises gastric pH to > 4 for approximately 9 hours in most children, with prolonged use rapidly leading to decreased duration of efficacy.

Lambert J, Mobassaleh M, Grand RJ. Efficacy of cimetidine for gastric acid suppression in pediatric patients. J Pediatr 1992;120:474-478.

This double-blind study examined the efficacy of oral cimetidine on gastric acid suppression in 27 pediatric patients. Patients underwent continuous gastric pH monitoring via pH probe during this study. Each patient received cimetidine in doses of 5, 7.5, and 10 mg/kg at 8-hour intervals. Eight of the patients received 15 mg/kg doses due to poor response to the first three dosages. Efficacy of gastric acid suppression was defined as gastric pH > 4. Due to the short duration of pH > 4, the study concluded that the current recommended doses of cimetidine may not be optimal for adequate gastric acid suppression in children.

Lacroix J, Infante-Rivard C, Gauthier M. Upper gastrointestinal tract bleeding acquired in a pediatric intensive care unit: prophylaxis trial with cimetidine. J Pediatr 1986;108:1015-1018.

This double-blind, controlled trial looked at the effect of cimetidine vs. placebo on gastric pH and the incidence of upper gastrointestinal tract bleeding in pediatric intensive care patients. Forty patients from 10 days to 14.5 years of age received 20 mg/kg/day (up to 1000 mg) of cimetidine or placebo divided every 6 hours. Outcomes were measured by evidence of upper gastrointestinal bleeding in the nasogastric tube and gastric pH. Cimetidine significantly increases gastric pH 3 hours after the first IV dose, but did not prevent upper gastrointestinal bleeds.

Lopez-Herce CJ, Albajara L, Codoceo R. Ranitidine prophylaxis in acute gastric mucosal damage in critically ill pediatric patients. Crit Care Med 1988;16:591-593.

This randomized study collected data on 40 pediatric intensive care patients with ages ranging from neonates to 17 years. Patients received either nasogastric ranitidine at 2 mg/kg/dose every 12 hours, nasogastric ranitidine at 4 mg/kg/dose every 12 hours, IV ranitidine at 0.75mg/kg/dose every 6 hours, or IV ranitidine at 1.5 mg/kg/dose every 6 hours. Gastric pH was determined every 2 hours through pH testing of nasogastric aspirates. The group receiving IV ranitidine at 1.5 mg/kg/dose every 6 hours had a higher risk of acute gastric mucosal damage and also had the highest median pH. This study recommended using IV ranitidine 1.5 mg/kg/dose every 6 hours in this population.

Hyman PE, Garvey TQ, Harada T. Effect of ranitidine on gastric acid hypersecretion in an infant with short bowel syndrome. J Pediatr Gastroenterol Nutr 1985;4:316-319

This report is the study of graded bolus IV ranitidine doses on gastric acid hypersecretion in an unfed 3-month-old with short bowel syndrome. Gastric volume and pH were measured serially for 12 hours following each bolus and correlated with plasma ranitidine concentrations. Increasing ranitidine boluses resulted in increasing acid inhibition. Gastric secretions were reduced by approximately 50% with all ranitidine doses.

Kuusela AL, Ruuska T, Karikoski R. A randomized, controlled study of prophylactic ranitidine in preventing stress-induced gastric mucosal lesions in neonatal intensive care unit patients. Crit Care Med 1997;25:346-351.

This prospective study enrolled 53 mechanically ventilated infants randomized to either the control group or treatment with prophylactic IV ranitidine 5 mg/kg/day divided into 3 doses for 4 days. Randomization was performed separately for the smaller vs. more mature infants to prevent one group from being skewed to term infants. The infants underwent upper GI endoscopy with biopsy specimens obtained when not contraindicated. The gastric mucosa was reported as normal in 61% of treated infants vs. 20% of control group infants. Eight gastric ulcers were diagnosed in the control group vs. none in the treatment group. The paper concluded that short-term prophylactic therapy prevents gastric mucosal lesions in infants under stress.

Kelly EJ, Chatfield SL, Brownlee KG. The effect of intravenous ranitidine on the intragastric pH of preterm infants receiving dexamethasone. Arch Dis Child 1993;69:37-39.

This prospective study enrolled 10 premature, parenterally-fed babies with bronchopulmonary dysplasia receiving 0.6 mg/kg/day dexamethasone in the neonatal intensive care unit. The patients had baseline measurements taken on day 1, then received dexamethasone on day 2, dexamethasone plus 0.031 mg/kg/hour ranitidine on day 3, dexamethasone plus 0.0625 mg/kg/hour ranitidine on day 4, and dexamethasone plus 0.125 mg/kg/hr ranitidine on day 5. Intragastric pH data was analyzed as 24-hour integrated gastric acidity. Gastric pH was significantly higher and integrated gastric acidity lower on days the patients received ranitidine. Infusions at 0.0625 mg/kg/hr and 0.125 mg/kg/hr (with no added benefit vs. 0.0625 mg/kg/hr) maintained pH values above 4, while the 0.031 mg/kg/hr infusion produced a median pH of 2.65.

Kuusela AL. Long term gastric pH monitoring for determining optimal dose of ranitidine for critically ill preterm and term neonates. Arch Dis Child Fetal Neonatal Ed 1998;78:F151-F153.

This study measured the effect of ranitidine treatment in 16 preterm and term infants (GSA 28-42 weeks) in the neonatal intensive care unit. The infants received 0.5-, 1-, or 1.5-mg/kg intravenous bolus doses of ranitidine to keep gastric pH > 4 on a 24-hour basis. Gastric pH monitoring occurred via pH probe. Gestational age and ranitidine dose both affected maintenance of pH > 4. The higher dose of ranitidine kept the gastric pH > 4 for the longest period of time. The increased gastric pH of preterm infants lasted longer than that in term infants. Based on gastric pH curves, the study concluded that 1.5 mg/kg IV three times daily

is optimal for term infants, while 0.5 mg/kg IV twice daily is sufficient for preterm infants.

Lloyd CW, Martin WJ, Taylor BD, et al. Pharmacokinetics and pharmacodynamics of cimetidine and metabolites in critically ill children. J Pediatr 1985;107:295-300.

This study followed 30 critically ill children with a mean age of 9.2 ± 3.2 years who received mean IV cimetidine doses of 26 mg/kg/day divided into 4 doses. Blood samples were taken before and after cimetidine infusion and each hour during the six hour interval for plasma concentration determination. Nasogastric aspirates were taken at 1.5 and 5.5 hours post infusion for gastric pH determination. Most patients had cimetidine concentrations below 1 μg/mL 4 hours after the dose. The apparent mean volume of distribution was 1.23 L/kg and the total body clearance was 10.4 mL/min/kg. The study concluded that cimetidine doses of 20-30 mg/kg/day administered in 6 divided doses would provide plasma concentrations of 1.3-2 μg/mL.

Eddleston JM, Booker PD, Green JR. Use of ranitidine in children undergoing cardiopulmonary bypass. Crit Care Med 1989;17:26-29.

This prospective, randomized, controlled trial studied 60 children ages 6 weeks to 10 years undergoing cardiopulmonary bypass for correction of congenital heart defects who were receiving either no treatment, 0.1 mg/kg/hr IV ranitidine, or 0.2 mg/kg/hr IV ranitidine. The aim of the study was to provide prophylaxis for stress-induced gastric ulcer by raising the gastric pH to at least 3.5. Nasogastric aspirations were pH tested every 3 hours for the first 24 hours. Both treatment regimens provided a gastric pH of at least 5.3 within 3 hours of cessation of cardiopulmonary bypass, with higher plasma concentrations but no additional benefit in the 0.2 mg/kg/hr group. The paper concluded that 0.1 mg/kg/hr is safe and efficacious in this patient population.

Osteyee JL, Banner W. Effects of two dosing regimens of intravenous ranitidine on gastric pH in critically ill children. Am J Crit Care 1994;3:267-272.

This study randomized 16 critically ill children into two groups. Group 1 received bolus dosing (1 mg/kg/dose q 6 hr x 2 doses) on day 1 and continuous infusion (0.15 mg/kg bolus followed by 0.15 mg/kg/hr) on day 2. Group 2 received continuous infusion on day 1 and bolus dosing on day 2. There was no statistical significance between the two groups, with both groups having gastric pH values above 4 during the treatment phase.

Wiest DB, O'Neal W, Reigart JR, et al. Pharmacokinetics of ranitidine in critically ill infants. Dev Pharmacol Ther 1989;12:7-12.

This study looked at pharmacokinetics following a single intravenous dose in 9 critically ill infants. The mean value for T1/2 was 2.09 h, apparent volume of distribution 1.61 L/kg, and total body clearance 13.93 mL/min/kg. The study concluded that based on steady-state concentration profiles, 0.7 mg/kg/dose IV every 6 hours should maintain serum levels above 40 ng/mL for 4.7 hours of the dosing interval. Disposition was described as a biphasic elimination curve.

Wells TG, Heulitt MJ, Taylor BJ, et al. Pharmacokinetics and pharmacodynamics of ranitidine in neonates treated with extracorporeal membrane oxygenation. J Clin Pharmacol 1998;38:402-407.

This study looked at pharmacokinetics and pharmacodynamics in 13 term neonates on extracorporeal membrane oxygenation (ECMO). Ranitidine was administered as a 2-mg/kg IV dose and intragastric pH was measured for response. Intragastric pH remained > 4 for a minimum of 15 hours. Elimination half-life was 6.61 ± 2.75 hours and 41.5% ± 22.2% of a single dose was eliminated within 24 hours. Twenty-four hours after the initial dose was given, a continuous infusion was started for 72 hours or until ECMO was discontinued. This study suggested than in term neonates with stable renal and hepatic function, ranitidine does not need to be administered more frequently than every 12 hours.

Chin TWF, MacLeod SM, Fenje P. Pharmacokinetics of cimetidine in critically ill children. Pediatr Pharmacol 1982;2:285-292.

This study looked at cimetidine pharmacokinetics after a single intravenous dose and three rates of continuous infusion in critically ill children. The mean elimination half-life was 1.44 ± 0.41 hours. Clearance was measured as 14.21 ± 2.85 mL/kg/min, with an apparent volume of distribution of 2.13 ± 0.63 L/kg. The study suggested a daily dose of cimetidine in children of 24 mg/kg.

Kraus G, Krishna DR, Chmelarsch D, et al. Famotidine. Pharmacokinetic properties and suppression of acid secretion in paediatric patients after cardiac surgery. Clin Pharmacokinet 1990;18:77-81.

This study looked at the disposition of famotidine in 10 pediatric patients with normal renal function after a single intravenous dose of 0.3 mg/kg. Plasma concentrations of famotidine were measured for 20 hours following administration, concurrently with gastric pH values. The elimination half-life was 3.3 ± 1.8 hours. The dose elevated gastric pH above 3.5 for 9 hours in 6 patients. The volume of distribution was 1.4 ± 1 L/kg and the plasma clearance was 0.3 ± 0.17 L/kg/hr. The study advised a regimen of 0.3 mg/kg/dose IV every 8 hours.

Martyn JA, Green B, Hagen J, et al. Alteration by burn injury of the pharmacokinetics and pharmacodynamics of cimetidine in children. Eur J Clin Pharmacol 1989;36:361-367.

This pharmacokinetic and pharmacodynamic study looked at increased cimetidine dosage requirements in pediatric burn patients. The mean clearance was 16.22 mL/kg, with a half-life of 1.06 hours. The study reported that 41% of the drug was excreted over 8 hours in burned pediatric patients versus 45% over 24 hours in healthy adult patients. The plasma concentration needed to increase the gastric pH to > 4 was ≥ 1 μg/mL (versus 0.5 μg/mL in adult burn patients).

PROTON PUMP INHIBITORS

Haizlip JA, Lugo RA, Cash JJ, et al. Failure of nasogastric omeprazole suspension in pediatric intensive care patients. Pediatr Crit Care Med 2005;6:182-187.

This open-label, pharmacodynamic study collected data on 18 mechanically ventilated patients ages 1-18 years in a pediatric intensive care unit receiving nasogastric omeprazole suspension. Continuous gastric pH monitoring was performed during administration and dose titration to a goal gastric pH > 4 for at least 75% of the dosage interval. Patients were categorized into three groups based on their response to 1 mg/kg omeprazole suspension as rapid, late, or nonresponders. The study concluded that nasogastric omeprazole had variable efficacy in this patient population because half of the studied patients required significant dosage increases or did not respond to therapy.

Olsen KM, Bergman KL, Kaufman SS, et al. Omeprazole pharmacodynamics and gastric acid suppression in critically ill pediatric transplant patients. Pediatr Crit Care Med 2001;2:232-237.

This open-label pharmacodynamic and pharmacokinetic study collected data on 11 pediatric liver and/or intestinal transplant patients receiving 0.5 mg/kg nasogastric omeprazole suspension every 12 hours. Continuous gastric pH monitoring occurred for the first 48 hours, and omeprazole concentrations were determined after the first dose and multiple dosing. The mean onset of action for omeprazole was 62 ± 82 minutes, with patients < 4 years of age exhibiting a more variable onset. Omeprazole concentration and AUC were greater with multiple dosing when compared with the first dose. The study concluded that twice daily nasogastric dosing of the suspension was effective in maintaining a gastric pH > 4 with maximal pharmacodynamic effect in this population.

Kaufman SS, Lyden ER, Brown CR, et al. Omeprazole therapy in pediatric patients after liver and intestinal transplantation. J Pediatr Gastroenterol Nutr 2002;34:194-198.

This open-label, pharmacodynamic study collected data on 22 pediatric liver and/or intestinal transplant patients aged 0.9 to 108 months receiving 0.5 mg/kg nasogastric omeprazole every 12 hours. Gastric pH monitoring occurred approximately 2 days after starting therapy. Mean gastric pH for all study patients was 6.1 ± 0.3, with 12 of the 22 patients showing a break of acid reduction before the following dose. In 4 of 5 patients experiencing a break in pH control to a mean pH < 5, shortening the dosing interval to every 6 or 8 hours resulted in an increase in mean pH to 6.6 ± 0.2. This study concluded that nasogastric omeprazole suspension is an effective acid-suppressing agent in this population with every 12 hour dosing sufficient for most patients, but every 6 to 8 hour dosing may be needed in select patients.

Rudolph CD. Are proton pump inhibitors indicated for the treatment of gastroesophageal reflux in infants and children? J Pediatr Gastroenterol Nutr 2003;37: S60-S64.

This paper reviews gastroesophageal reflux in children and the extraesophageal signs and symptoms. The author concludes that there are not enough randomized, controlled trials in the pediatric population to support the safety of long-term acid suppression by proton pump inhibitors in children.

Kearns GL, Winter HS. Proton pump inhibitors in pediatrics: relevant pharmacokinetics and pharmacodynamics. J Pediatr Gastroenterol Nutr 2003;37: S52-S59.

This paper reviews the effect of cytochrome metabolism, different formulations, and genetic polymorphisms on pharmacodynamics and pharmacokinetics of proton pump inhibitors. It goes through current proton pump inhibitor pharmacologic data in pediatrics and the implications of all on new study design.

Guillet R, Stoll BJ, Cotton CM, et al. Association of h_2-blocker therapy and higher incidence of necrotizing enterocolitis in very low birth weight infants. Pediatrics 2006;117:137-142.

This case-control study analyzed data from the National Institute of Child Health and Human Development Neonatal Research Network registry (September 1998 to December 2001) to determine if there is an association between the use of h_2-blockers and the incidence of necrotizing enterocolitis (NEC) in infants from 401 to 1500 grams birth weight. Three case controls were matched to each NEC case on the basis of birth weight, race, and center because each is associated with the incidence of NEC. Infants who received any h_2-blocker were included, excluding those who received the therapy the day before NEC diagnosis or later. After conditional logistic regression, h_2-blocker use was associated with an increased incidence of NEC.

COMPARISON OF AGENTS

Lopez-Herce J, Dorao P, Elola P, et al. Frequency and prophylaxis of upper gastrointestinal hemorrhage in critically ill children: A prospective study comparing the efficacy of almagate, ranitidine, and sucralfate. Crit Care Med 1992;20:1082-1089.

This prospective, randomized, controlled trial enrolled 165 pediatric intensive care patients with one or more risk factors for upper gastrointestinal hemorrhage into four groups. Patients either received no treatment, 0.25-0.5 mL/kg nasogastric almagate every 2 hours, 1.5 mg/kg IV ranitidine every 6 hours, or 0.5-1 g nasogastric sucralfate every 6 hours. Gastric pH and macroscopic bleeding (defined as nonhemorrhage, slight, or important) was determined in all patients. Guaiac testing in 72 patients investigated microscopic bleeding and the severity of illness was classified with several scales. Upper gastrointestinal hemorrhage was higher (by 20%) in the no treatment group than the others; there was no difference among the other treatment groups.

Martyn JA. Cimetidine and/or antacid for the control of gastric acidity in pediatric burn patients. Crit Care Med 1985;13:1-3.

This retrospective study was a chart review of 20 pediatric patients with burns covering more than 40% body surface area who received either cimetidine 5-10 mg/kg IV every 6 hours, 15-30 mL antacid every 3 hours, or the combination of the two drugs. Guaiac and pH tests, used as the efficacy measure, were performed at least 1 hour after drug administration. The cimetidine group had the highest frequency of pH values ≤ 3.5, and the combination group had no greater efficacy. In all groups, pH values ≤ 3.5 were associated with positive guaiac tests. In four patients studied prospectively, 63% of drug was detected in urine 8 hours later, as opposed to 24 hours later in adult studies. The paper concludes that rapid clearance of cimetidine may lead to decreased efficacy in this population.