# Early 1976 Study in Dog Model

- Bishop & Weisfeldt looked at arterial pH and $PCO_2$ with and without sodium bicarbonate administration after inducing Vfib

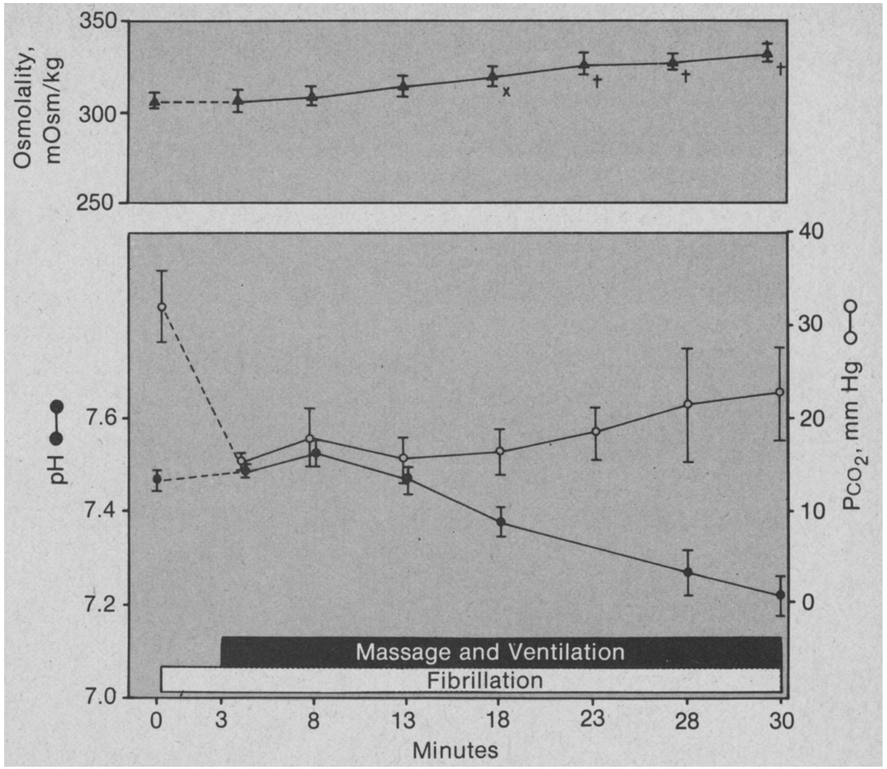
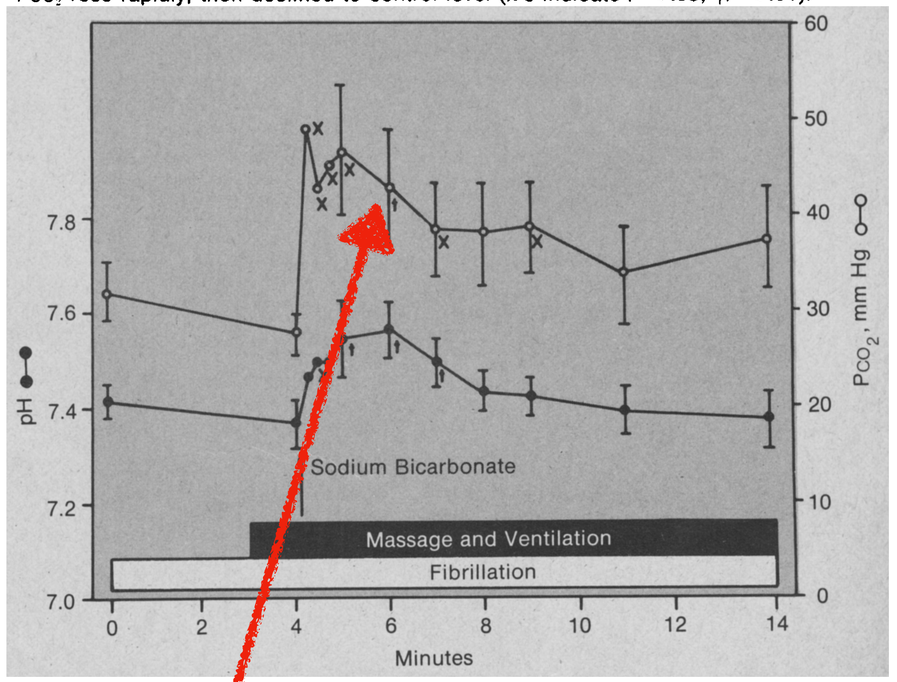



Fig 1.—Arterial pH, $Pco_2$, and osmolality in seven dogs prior to and during arrest and resuscitation without bicarbonate administration. Ventilatory rate and volume were constant throughout. $Pco_2$ fell with onset of resuscitation despite constant ventilation. Progressive rise in osmolality throughout is statistically significant (x's indicate $P < .05$; †$P < .01$). Bars indicate standard error of mean.

Fig 2.—Arterial pH and $Pco_2$ in nine dogs prior to and during arrest and resuscitation. At one minute of resuscitation, 1.0 mEq/kg of 7.5% sodium bicarbonate was administered rapidly via superior vena cava. Following sodium bicarbonate administration, pH and $Pco_2$ rose rapidly, then declined to control level (x's indicate $P < .05$; †$P < .01$).




excess $CO_2$ likely leading to ↓ intracellular pH

**Table 1.** Clinical Studies Evaluating the Effect of Sodium Bicarbonate in Cardiac Arrest (from [10])

| Author | Origin, year | Study design | Findings |
|---|---|---|---|
| Aufderheide et al [24] | Wisconsin, USA, 1992 | Retrospective chart review, 619 arrest pts, 273 had ROSC | No association between SB and survival |
| Bar-Joseph et al [15] | Pittsburgh, PA, USA, 2002 | Retrospective study, 2,915 pts from brain resuscitation clinical trial III dataset | SB given in 54% of cases, use increased with ACLS duration. SB should probably be given earlier. |
| Bar-Joseph et al [4] | Pittsburgh, PA, USA, 2005 | Retrospective study, 2,122 pts from brain resuscitation clinical trial III dataset with ACLS lasting < 30 min | Earlier and more frequent use of SB associated with higher resuscitation rates and better long-term outcome |
| Bishop and Weisfeldt [25] | Baltimore, MD, 1976 | Experimental data from seven dogs, clinical data from six cardiac arrest pts | SB increases $PCO_2$, accentuates intracellular acidosis in poorly ventilated pts, may be useful in well-ventilated pts |
| Delooz and Lewi [25] | Leuven, Belgium, 1989 | Retrospective data analysis | SB > 1 mEq/kg associated with poor outcome |
| Dybvik et al [11] | Oslo, Norway, 1995 | RCT, SB (245 pts) vs. 0.9% NS (257 pts) | SB therapy had no effect on outcome |
| Geraci et al [18] | Jacksonville, FL, USA, 2009 | Retrospective chart review, all CPR cases in 2005 - 2006, 88 pts received SB | SB linked with alkalemia in 16% of pts, recommendation for early collection of ABG sample |
| Mattar et al [22] | Los Angeles, CA, USA, 1974 | Case series, 12 pts, SB in cardiac arrest | Plasma osmolality > 400 mOsm/kg, serum Na concentrations > 200 mEq/L |
| Roberts et al [9] | Winnipeg, Manitoba, Canada, 1990 | Retrospective study, 326 pts | Survival 4.2% (10/238) when SB given vs. 27.8% (20/72) when SB not given (P = 0.049) but SB use may reflect presence of severe acidosis |
| Stiell et al [10] | Ottawa, ON, Canada, 1995 | Observational cohort study, 529 pts in 2 years received epi per ACLS guidelines | Logistic regression did not show association between SB and survival |
| Suljaga-Pechtel et al [27] | New York, NY, USA, 1984 | Prospective observational study, 277 arrests in 226 pts | Survival lower in pts who needed SB, likely due to illness severity |
| van Walraven [12] | Ottawa, ON, Canada, 1998 | Prospective cohort study, 773 pts with cardiac arrest, logistic regression for OR and 95% CI | 269 of 773 pts survived the first hour. SB use significantly associated with unsuccessful resuscitation |
| Vukmir and Katz [16] | Pittsburgh, USA, 2006 | RCT, 792 patients, SB (420 pts) vs. placebo (372 pts) | Overall survival 13.9% (110/792), no difference between groups. Trend for improved survival with SB in prolonged (> 15 min) arrest |
| Weaver et al [28] | Seattle, WA, USA, 1990 | RCT, lidocaine (n = 106) vs. epi (n = 93); historical controls (n = 132) for SB | Higher survival with SB infusion, which was done before the study started |
| Weil et al [23] | Chicago, IL, USA, 1985 | Cohort study, 105 cardiac arrest pts, all received SB | Survival lower if pH > 7.55 within 10 min of CPR |
| Weng et al [21] | Taiwan, 2013 | Retrospective cohort, 92 pts (30 with vs. 62 without SB) | SB did not improve rate of ROSC in prolonged (> 15 min) cardiac arrest |

ABG: arterial blood gas; ACLS: advanced cardiac life support; CI: confidence interval; CPR: cardiopulmonary resuscitation; min: minutes; epi: epinephrine; pts: patients; OR: odds ratio; RCT: randomized controlled trial; ROSC: return of spontaneous circulation; SB: sodium bicarbonate.