

**BINDER CONSUMPTION AS A FUNCTION OF TIME: A  
LINEAR MODEL FOR LOWERING ELEVATED  
PHOSPHORUS LEVELS BY IMPROVING BINDER TIMING**

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Failure to properly time binders to “catch” phosphorus-laden foods can cause patients to experience hyperphosphatemia and the complications that accompany it. Proper binder timing is often left out of conversations with non-adherent patients when discussing elevated phosphorus and subsequent binder dosing. Based on gastric emptying research of patients with and without dyspeptic symptoms typically associated with gastroparesis, two [linear] mathematical models were developed for properly timing binder consumption. Our center (Downriver Kidney Center in Allen Park, MI) emphasized the need for a strict regimen to time binder consumption during each meal. The purpose was to maximize per-pill binder potential. The [linear] dosing models account for marginal phosphorus binder consumption during meals/snacks to ensure a continuous supply of phosphate binders throughout meals/snacks to properly time phosphate binding. Using the time (t) interval of 20 minutes as the standard significant emptying time interval, binders might be taken at time  $t_0$ ,  $t_0+20$ ,  $t_0+40$ , ... $t_0+20n$ , where  $t_0$  represents the time immediately following the first bite of food and 20 minute intervals are added to the time  $t_0$  at which time an additional binder would be consumed.

Our results showed that structured education based on our mathematical models of proper per meal binder timing resulted in an approximate 40% reduction in the phosphorus levels for the non-adherent patients. These models are not meant to imply that a patient ought to take a pill every 20 minutes without limit. Rather, the models are meant to illustrate that timing binder consumption appropriately is the missing variable when making decisions related to dosing. The variable of “time” must be added to the discussion of conventional dosing variables such as height, weight, present phosphorus level, and anticipated phosphorus consumed. Implementing an educational lesson plan for patients related to properly timing their binders may affect the phosphorus levels of chronically non-adherent patients. Further research is recommended.