Purpose: Recent technological advances enable radiotherapy to be delivered in a highly conformal manner almost anywhere in the body. This has renewed interest in hypofractionation wherein the tumor is delivered a few fractions of large dose/fraction. Extrapolating clinical experience with conventional fractionations to fractions of high dose is important when designing hypofractionated regimens. Methods and Materials: The concept of biologically effective dose (BED) based on the linear-quadratic (LQ) formulation $e^{(aD + bD^2)}$ is useful for intercomparing conventional fractionations but is suspect at high dose because the LQ curve bends continuously on the log-linear plot. A linear-quadratic-linear (LQ-L) formulation which better fits the final exponential response of experimental dose-response studies at high dose is described. This new formulation requires only one new term, the dose $D_T$ at which the LQ curve transitions to a linear tail. LQ-L is applied to published dose-response curves and the clinical implications of LQ-L are examined across a wide range of fractionations. Results: For fractions of high dose, the LQ formulation underestimates the dose per fraction required to maintain equivalency with conventional regimens. The LQ-L model fits a wide variety of experimental survival data over a wide range of dose. When $D_T = 2a/\beta$ Gy, the line tangent to the LQ curve at $D_T$ intersects the $e^{aD}$ and $e^{bD^2}$ curves at dose $a/\beta$ and also closely fits the linear response in the high dose region of many in vitro studies. Conclusion: For fractions of high dose LQ-L gives better estimates of BED than LQ because LQ-L better fits experimental dose-response in the high dose region. This is particularly important when planning hypofractionated regimens for reactions with low $a/\beta$ such as prostate cancer or late sequelae because $D_T = 2a/\beta$ Gy for these reactions falls within the contemplated range of hypofractional doses.