In this paper we consider nonlinear models with an arbitrary number of covariates for which the information additionally depends on the value of the linear predictor. We establish the general result that for many optimality criteria the support points of an optimal design lie on the edges of the design region, if this design region is a polyhedron. Based on this result we show that under certain conditions the D-optimal designs can be constructed from the D-optimal designs in the marginal models with single covariates. This can be applied to a broad class of models, which include the Poisson, the negative binomial as well as the proportional hazards model with both type I and random censoring.