Purpose:We are introducing a dosimetric system for calculation of dose distribution within patients from total skin electron beam (TSEB) in order to avoid large dose variations and frequent setup changes for accurate and safe TSEB therapy of mycosis fundoides.

Methods:Custom cylindrical phantoms were made of a set of buckets filled with water and wrapping with bolus outside. Films placed at depths of interest in the cylindrical phantoms and flat solid water phantom were irradiated using 6-MeV high-dose-rate TSEB from an Elekta Synergy linear accelerator. Horizontal and vertical fluence profiles as well as depth-dose curves were measured by positioning the flat phantom at various locations. Curvature factors were determined by the dose curves across the films in the cylindrical phantom and quantified as functions of the curvature radius and the angle between the TSEB and local surface norm. The off-axis and curvature factors were used in calculation of the skin-depth dose distribution in any body parts for individual beams. Sum of the doses from all beams provides the total skin dose distribution. The calculation requires only the toward beam body surfaces that can be captured with 3D cameras.

Results:Repeated phantom experiments confirmed the dose calculation accuracy within 5%. Computer simulation for patients with different body shapes and treatment setup using the Stanford technique agreed with the results of in-vivo dose measurements. Dose variation from different techniques including changes from 60 to 45 degree turntable angles for oblique beams in Stanford technique and rotation TSEB were simulated.

Conclusions:This simple and accurate dosimetric system allows users to predict total skin dose distribution and distribution changes with different treatment techniques. Importantly, it allows users to plan and optimize TSEB treatment.