Several reports have presented analyses of heart complication rates following external beam radiation therapy. In this study we develop a measurement of normal tissue complication probability for whole and partial heart irradiation for a cohort of 198 patients treated between 1970-1984. The median follow-up time was 84 months. For all these cases, the anterior projection of the heart areas, and field outlines, have been graphically recorded for each field. These anterior projections have been compared against similar projections for 6 standard hearts for which three-dimensional reconstructions were made from comprehensive CT scans using the ADAC Pinnacle radiation therapy treatment planning system. By mapping the treated heart fields into the best matched standard hearts, on the basis of area and shape, we are able to estimate the fraction of underlying heart tissue, by compartment, contained in each voxel. We have then translated the dose distributions for each treated field into the corresponding best volumetric representation, enabling us to integrate dose verses volume for each patient. Dose-volume histograms (DVHs) have been constructed for each heart and heart compartment and averages are developed as a function of treatment methodology. From these DVHs we calculated NTCPs using our own, as well as existing dose-response data. In addition, DVHs and analysis have been performed on the high-resolution reference data for each technique.