Purpose: To devise a method for IMRT QA using a Pinnacle model for the EPID response which accounts for non-uniform backscatter from the support arm.

Method: The method is based on a Pinnacle treatment planning system model. It relies on determining a correction matrix (CM) that multiplies the (flood-field calibrated) EPID image to restore pixel response to backscatter and subsequently constructing a backscatter region within the Pinnacle model that reproduces the effect of backscatter from the EPID support arm. The CM is constructed from a series of profiles calculated as the ratio of modelled to acquired slit-beam fields. Each slit beam is offset so that the series covers the entire EPID area. Slit beams are used to minimize the dependence of response to backscatter. The CM represents the flood-field response of the EPID mounted on the support arm as if it had been calibrated in the absence of backscatter. An iterative fitting procedure is used to adjust the backscatter region in the Pinnacle model so that the modelled flood-field response matches the CM.

Results: As expected, arbitrary-field EPID images multiplied by the CM agree well with Pinnacle model results incorporating the backscatter region. The method was tested for 10, 20, and 30 cm square fields and shown to reduce discrepancies between the Pinnacle calculation and EPID images from 3.3, 8.3 and 9.4 %, to 0.8, 2.2 and 1.1 % respectively for the three fields.

Conclusions: A novel method for IMRT QA was developed whereby acquired EPID images are multiplied by a pre-computed correction matrix and then compared to the response from a Pinnacle model which incorporates a non-uniform backscatter region. The method is easy to use in clinical practice and does not require measurements involving the removal of the EPID from the support arm.