Supplemental info for "Factor ten expedience of monthly linac QA via an ion chamber array and automation scripts."

S1 Fields

An example set of fields for monthly QA is given in Tab. **S1**. For photon measurements, a 25x25 cm^2 square field measurement provides output, flatness, symmetry, and jaw position information. These are then repeated with gating. A 20x20 enhanced dynamic wedge (EDW) field provides wedge factor constancy. The wedge angle can also be analyzed if desired. For electron measurements, a 25x25 cm^2 cone was used to measure output, flatness, and symmetry.

Photons (repeat for each energy)							
	Field Size (cm^2)				**Dose** (MU)	**Dose Rate**	
Output, profile, rad vs. light, FS	25x25				100	max	
Dose rate constancy + MU linearity	25x25				50	min	
Gated dose constancy	25x25				100	max	
EDW constancy	20x20				100	Max	
Energy constancy (quad wedge)	25x25				50	Max	
Electrons (repeat for each energy)							
Output, profile, rad vs. light, FS	25x25				200	clinical	
Energy Constancy	25x25				50	Max	
Mechanical							
Collimator walkout							**Coll** (°)
Using 6X	15x15				20	max	C200
	15x15				20	max	C270
	15x15				20	max	C90
	15x15				20	max	C160
Jaw positions	**X_1**	**X_2**	**Y_1**	**Y_2**			
Using 6X	-10	0	-10	+5	20	max	
	0	10	-5	10	20	max	
	-1	10	-10	0	20	max	
	-10	1	0	10	20	max	

Tab. S1. Table of monthly QA delivered fields.

S2 Backscatter dependence

It was confirmed that the inbuilt backscatter of 2.3 g/cm^2 was not sufficient to make the measurements independent of the detector placement on the treatment couch. The proximitiy of metal bars inside the couch were found to affect proximal detectors by up to 2%. To investigate this backscatter effect measurements were made with increasing thickensses of solidwater backscatter. For each backscatter thickness, central axis dose measurements were made with and without a brass bar beneath the detector (Fig. S). This test showed that for 6 and 15 MV photons 4-5 cm additional solid water backscatter was sufficient to negate the effects of metal objects beneath the detector.

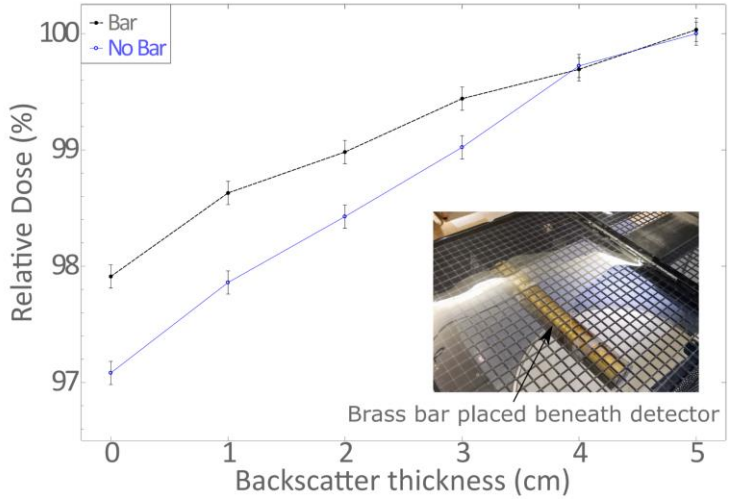

Fig. S2 Backscatter test. Central axis dose measurements from IC profiler with and without a brass tube (75mm diameter, 5mm wall thickness) placed under the couch beneath the detector. The approximately 1% difference without additional backscatter indicates that results will depend on couch placement unless 4 cm or more backscatter is added. SETUP: Source to detector surface 105 cm, buildup 0.9 cm (built in), field size 25x25cm^2, 6MV photons, 600MU/min, 100MU per measurement.

S3 beam Energy measurements - Quad wedge vs. Annual QA water tank data.

Figure S3 shows the is the difference between the calibrated ICprofiler quad wedge R50 measurement and water-tank measurements for 5 different linacs. The sub-mm differences can be caused by inconsistent setting of the water surface at annual QA measurements, slight setup errors in either measurement, noise, or linac energy variation in the time bteween the measurements. The difference itself is independent of the small variations in R50 between the linacs (R50 numbers given in table 1 for 2 linacs).

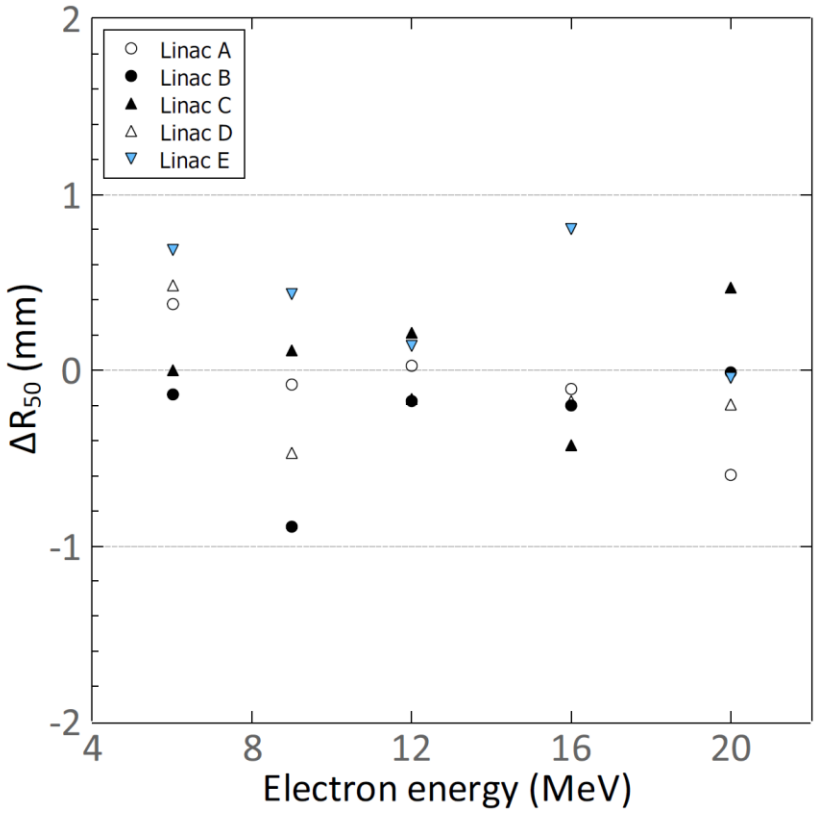

Fig. S3 Differences between IC profiler and water tank measured R50 numbers across 5 linacs and 5 different electron energies. The standard deviation of these differences was 0.4mm.

S4 Alignment aids

Some care is required when placing the IC profiler on "tennis-racket" couch surfaces since its center of mass is towards the electronics, it can sit un-level on the couch. To aid alignment Multi-level Shims were designed and 3D printed (see below). The shim has steps of different height that may be placed under each side of the IC profiler to adjust the relative height of each side and help level the device.

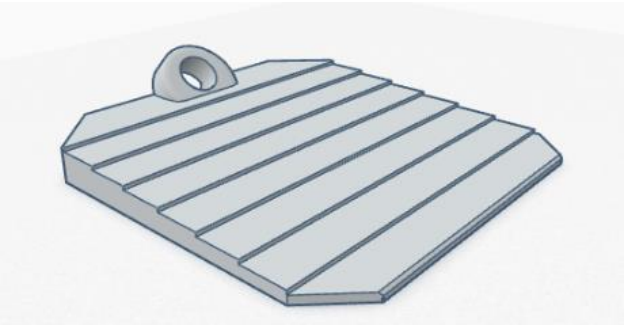

Fig. S4 Multi level shim design used to help align the IC profiler. This is a 3D printable design.